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FROM CAMPAGNA TO ARCADIA: CHANGES IN THE RECEPTION OF TERRACED LANDSCAPES IN ART AND THEIR PRACTICAL IMPLICATIONS

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ABSTRACT

As upholders of the Campagna ideal of the Renaissance, (terraced) agrarian landscapes played an important role in ancient times: their appearance in Italian landscape painting testifies to an aesthetic sense for agriculture that was prevalent at the time. Later, however, terraced landscapes disappeared from view for a long time because the aesthetic ideal increasingly turned towards Arcadian scenes of nature with idealized natural, wooded, and pastoral landscapes. Their reappearance in nineteenth-century art and literature promoted the public appreciation of terraced agrarian landscapes. However, the agrarian landscapes of the intensively used lower regions are hardly any longer linked with scenic beauty. We therefore postulate that landscapes that are not aesthetically charged are in danger of being left at the mercy of urbanization and sheer functionality.

Keywords: terraced landscapes, Campagna, Arcadia, agrarian landscapes, reception

DALLA CAMPAGNA ALL'ARCADIA: CAMBIAMENTI DELLA PERCEZIONE DEI PAESAGGI TERRAZZATI IN ARTE E LE LORO IMPLICAZIONI NELLA PRATICA

RIASSUNTO

Come elemento chiave dell'ideale della Campagna del Rinascimento, i paesaggi agrari (terrazzati) assumevano già un ruolo importante nei tempi antichi: la loro apparizione nella pittura di paesaggio dimostra un prevalente senso estetico per l'agricoltura. Eppure più tardi, i paesaggi terrazzati sono spariti di vista per un lungo periodo, a causa di un orientamento dell'ideale estetico verso l'immagine dell'Arcadia che idealizza i paesaggi naturali, forestali e pastorali. La loro riapparizione in arte e letteratura nel XIX secolo ha rinforzato la stima nel pubblico per i paesaggi agrari terrazzati. Al contrario, i paesaggi delle pianure coltivati intensivamente non vengono spesso valutati in riferimento alla bellezza. Ipotizziamo dunque, che i paesaggi che non vengono apprezzati esteticamente rischiano di essere esposti all'urbanizzazione e alla trasformazione puramente funzionale.

Parole chiave: paesaggio terrazzato, Campagna, Arcadia, paesaggio agrario, percezione

INTRODUCTION

Landscape and beauty are closely linked. The aesthetic experience of urban and rural cultural landscapes influences people's wellbeing and happiness. Land becomes landscape, when, thanks to sensory perception, it triggers sensations or is changed through symbolizations into something new, a kind of inner "invisible landscape." These constructs of landscapes are idealizations; they largely originated in antiquity and, especially, in the Italian Renaissance, influenced aesthetic judgements about landscapes (Rodewald, 2013). Thus, the beautiful landscape (Ital. *bel paesaggio*) was already explained by Marcus Terentius Varro (first century BC) in terms of the useful (Lat. *utilitas*) and the aesthetic (Lat. *delectatio*) in connection with the construction of Roman villas outside the cities (Meissner, 1999).

During the Renaissance, agriculture—particularly farming—was at the center of the artistic reception of the landscape and thus also in demand by the urban aristocracy. Ploughmen, oxen, donkeys, fences, cultivated terraces, and furrowed fields surrounded by hedges, embedded in a painted, realistic landscape (in the Verismo style), with streets, paths, farms, and villages, symbolized the necessity of farming to feed urban populations, such as those of Venice. In this glorification, reference was made to Virgil (70–19 BC) and his *Georgics*, a poem describing various farming techniques, which was continued by later agronomists and linked to the ideal of rural life according to ancient tradition. This turn to a simple rural life was the key theme in landscape painting during an intense but brief period, already appearing in the famous fresco *Allegoria del Buon Governo* (Allegory of Good Government) by Ambrogio Lorenzetti in Siena (c. 1338), and the calendar landscapes dominated by farm work in the frescoes in the Eagle Tower (Ital. *Torre di Acquila*) in Trent (end of the fourteenth century) and the better-known *Les Très Riches Heures du Duc de Berry* (The Very Rich Hours of the Duke of Berry) by the Dutch Limburg brothers (c. 1416). Arable farming was also depicted in the famous 1444 painting by Konrad Witz, *The Miraculous Draft of Fishes*. The conception of that time was that the beauty created by the artist in his works should surpass nature, allowing it to become visible through the artistic creation (Liessmann, 2009). From the 1420s onward, the Italian artists' guild understood the landscape as an illusionary and realistic image of the land (Büttner, 2006).

The reception of the landscape in art provides valuable information on the socioculturally changing relationship of real to idealized landscapes (Büttner, 2006) and allows conclusions to be drawn about public perception and prevailing preferences for certain scenes. Thus, Emilio Sereni developed an image of the agricultural history of Italy based on written and pictorial sources (Sereni, 1961). In a recent study of the history of the reception of terraced landscapes in painting and literature in the Valais (Switzerland), the earliest mentioned representation of terraced mountain slopes was a woodcut from 1550 (Rodewald, 2011). In travel literature, however, it was only in 1761 that Jean-Jacques Rousseau (1978; original: 1761), in his epistolary novel *Julie, or the New Heloise*, made a brief reference to the terraced vineyards he saw on a trip to Valais in 1744. Nonetheless, terraced landscapes, albeit more dominantly for viticulture than for farming, existed in Valais from the eleventh century onward, and are likely to have been very widespread since the thirteenth century (Wein- und Rebbaumuseum, 2010).

If one considers the written, and especially pictorial, sources of the reception of agrarian landscapes (understood as all landscapes that are cultivated; that is, arable farmland and terraced vineyards, but not pastoral land), a change in aesthetic appreciation is evident. There was hardly another type of landscape that had disappeared—since its idealization in the heyday of the late Middle Ages and the Renaissance, also in Flanders and Italy—so radically out of the artist's view and the interest of the observer, as agrarian landscapes, only to reappear out of its aesthetic doldrums as of 1800, in the form of its most spectacular expression as terraced landscapes. Since then, they have been considered globally to epitomize beautiful landscapes, as also reflected by the UNESCO World Heritage List. In contrast, the unspectacular agrarian landscape of plains and hills never recovered from its fading into artistic—and therefore also aesthetic—insignificance. It remained largely a landscape of functional production, consequently almost defenselessly at the mercy of agglomerations' growing demand for construction.

This contribution shows how, during the heyday of landscape painting of the fifteenth and sixteenth centuries, a radical change took place in the aesthetic image of the landscape. It went from a rural Campagna idyll based on an agrarian (farmed) landscape, to the Arcadian ideal, with its increasingly dramatic and symbolic portrayal of nature and its emphasis on natural, wooded, and pastoral landscapes. This led to the loss of aesthetic interest in agrarian land, particularly in its terraced form on slopes, until it increasingly reappeared only in the nineteenth century. In this study, we start with Italian landscape painting in the Renaissance, broadening our view to encompass the artistic representation of Swiss terraced landscapes in the Valais, and discuss to what extent artistic representation also shapes public appreciation for a landscape. We link this to the use of and views on the landscape today: if we perceive no beauty in our farmland, its meaning is often reduced to pure functionality and efficiency, which often results in a carelessly arranged landscape.

THE AGRICULTURAL IDEAL AS REPRESENTED IN TWO TOPOI, CAMPAGNA AND ARCADIA

A) CAMPAGNA

The term Campagna referred to the "typically rural" and was accompanied by the idealization of the *vita rus-*

tica (rural life) which was meant to be useful, virtuous, and at the same time pleasant. In reality a hilly landscape surrounding Rome and Naples, the Campagna has inspired painters, writers, and educational travelers since the Renaissance, and it became the ideal of a well-kept rural landscape. The elevation of rural life suited the vision of well-heeled city dwellers, who with their desire for a *villa rustica* (country villa) in the Campagna also helped construct the character of the land, both in thought and in reality.

In *De re aedificatoria* (On the Art of Building, 1485), Leon Battista Alberti also emphasized the importance of including the correct design of the surrounding countryside in plans for villa construction (Fischer, 2012). The topos of the beautiful (cultivated) landscape as a culturally justified relationship of the contemplative with the useful side of peasant life allows the term *agricoltura* to be understood in the sense of "agri-culture." However, nature should always remain picturesque, and, according to the Tuscan agronomist Luigi Alamanni, only be subjected to gentle, imitative tasks (Sereni, 1961).

The appeal of Campagna involved the "purity of the air," the "serenity of the sky," "distance from the diseases of the cities," the "loneliness of life," "distance from noise," "natural joy at the fields," "purity of customs," the "good life," and "happiness" (Mathieu Castellani, 2003, 33ff). In other words, particular importance was attached to the cultural component of the landscape.

However, the topos of the Campagna also had ecological downsides: large-scale deforestation especially on the hills; the reclamation and drainage of swamps; and the conversion of mixed-use, irregularly located meadows, fields, vineyards, and the originally closed cultivated areas into open fields and meadows, which led to the first clearing of the cultivated landscape (Sereni, 1961). This continued throughout the industrialization of agriculture and persists today.

B) ARCADIA

The concept of Arcadia goes back to Virgil and Jacopo Sannazaro, and idealized a natural, wooded, and exclusively pastoral landscape, which was regarded as the ideal land (German: *Sehnsuchtsland*; Rodewald, Gantenbein, 2016). With his work *Arcadia* from 1502/1504, Sannazaro sparked an unexpected wave of enthusiasm that started in the place of publication, Venice. His Arcadia, populated by shepherdesses and shepherds, satyrs, and nymphs, was both an autobiographical landscape (he grew up in the Picentine Mountains near Salerno) and an imaginary one, a place he wistfully associated with happiness and a rediscovered golden age. This topos of an idyllic landscape became a key element in painting, literature, music, and humanistic philosophy. Between 1500 and 1520, during the creative phase of Giorgione, Giovanni and Gentile Bellini, Cima da Conegliano, the young Titian, Lorenzo Lotto, Giulio Campagnola, and others, the Campagna motif began to be mixed with that of the bucolic; that is, the natural, wooded, and wild (possibly also because of the strengthening influence of the pictorial language of northern artists such as Albrecht Dürer; Büttner 2006). In parallel, there was a shift in the type of agricultural activity depicted in the paintings, from farmers working in the fields (the Campagna ideal) to pastoral activity by shepherds with their flocks (Arcadia).

The pastorally oriented nature idyll was associated with a glade in the middle of flowering meadows with stately individual trees, surrounded by a wild-looking forest. It also includes meandering streams, and sometimes waterfalls, springs, and grottos. Waterfowl, wild geese, and deer and bulls also join the scene. Even wild animals such as wolves, bears, and foxes do not feel particularly threatening. Sometimes it is possible to catch a glimpse of distant broad plains with homes and brightly lit mountains in the background. There are gravestones and other mysterious traces of the past. The bucolic scenery of Arcadia is ideally linked to the most pleasant weather conditions, which only a lasting spring can provide: "a long celebration of nature" (Wehle, 2008, 45). The Arcadian themes of nature dominated artists' representations of the landscape until the Romantic period. Meanwhile, arable farming as well as terraced landscapes widely disappeared from landscape painting.

Both topoi of scenic beauty are often not clearly separable; namely, in the highly productive phase of landscape painting at the start of the sixteenth century. Thus, in certain lyrical texts such as those of François de Belleforest (1559), the *vita pastorale* (shepherds' life) and the *vita rustica* (rural life based on farming) are intertwined. But a stronger emphasis began to take place on the natural moods of a landscape with its powerful elements—the play of light and shadows, the rivers, glades, and a wilderness—which underlined the free life of the shepherds far from the city, amid fantastic scenery. With Guercino, Nicolas Poussin, Claude Lorrain, and Salomon Gessner, the Arcadian pastoral landscape achieved classical perfection in the seventeenth and eighteenth centuries. However, at the start of Romanticism Arcadia disappeared (Brandt, 2006), unable to keep up with the happy promise of progressive thought. In *Faust, Part Too*, Johann Wolfgang von Goethe (1986; original: 1832) let it die as an illusion of an ancient place of happiness. Later, Arcadia was reduced to a private idyll of the bourgeoisie. However, it had nonetheless maintained the power to justify the nature conservation movement of the end of the nineteenth century, which in turn re-emerged in the environmental movement that began in the 1960s. Thus, Arcadia today lives on in nature conservation, but also in widely appreciated mountain agriculture; that is, today's pastoralism.

METHOD OF ANALYSIS

This study used the following method to assess the reception of landscapes depicted in Renaissance paintings. First, we viewed the most important works of landscape painting of the Venetian school (as represented in the museums and churches of Venice, and dominant in the fifteenth and sixteenth centuries), and investigated the prevalence of agricultural fields or terrace-like structures. We complemented these observations with studies on a broad selection of literature on Italian landscape painting of the Renaissance, as well as some texts from around 1500 (e.g., by Pietro Bembo and Jacopo Sannazaro). To identify terraces, the analysis of historical agrarian landscape forms by Sereni (1961) was used as an aid. The study differentiated between terraces with gentle slopes (Ital. *ciglionamento*) and steep terraces (Ital. *a gradoni*), which were constructed to enable the cultivation of slopes. The analysis of the representation of agricultural landscapes was placed in relation to the two landscape ideals, Campagna and Arcadia, and subsequently also to the terraced landscapes of Valais—which, as a popular travel destination, was referenced in a wealth of art and literature at the time.

A more detailed presentation of the appearance of terraced landscape painting of the Venetian Renaissance period as well as of the terraced landscapes of Valais was published, in German, in the journal *Naturschutz und Landschaftsplanung* (Nature Conservation and Landscape Planning; Rodewald, 2014) and in the publication *Ihr schwebt über dem Abgrund – die Walliser Terrassenlandschaften: Entstehung – Entwicklung – Wahrnehmung* (Hovering on the Brink. Terraced Landscapes of the Valais: Creation—Development—Perception; Rodewald, 2011; French translation: 2013).

RESULTS: THE RISE AND FALL OF TERRACED LANDSCAPES IN ART

A) THE FIRST APPEARANCE OF EMBANKMENTS AND SLOPE-PARALLEL STRUCTURES IN GOTHIC AND EARLY RENAISSANCE PAINTING

One of the earliest depictions of obviously cultivated horizontal hill areas with regular tree planting on the slopes is the mid-fourteenth century work *Orazione nel giardino degli Ulivi* (The Prayer in the Garden of Olives) by Barna Senese. According to Sereni (1961), this is the first conscious representation of a landscape form that moves towards terracing, which was widespread in Tuscany during the Renaissance. In linear, almost terrace-like form, vines are depicted on the fresco by Ambrogio Lorenzetti. The individual plant lines follow the slope outline and are, as in the bocage landscapes in France, enclosed by hedgerows or rows of trees, as was common for a long time. Nonetheless, Otto Pächt (2002) called the frequently occurring terrace-shaped rocks "corkscrew mountains," a typical form of the depiction of mountain landscapes in the Middle Ages, which was still prevalent in the fifteenth century (e.g., in Jacopo Bellini's work *San Gerolamo nel deserto* 'Saint Jerome in the Desert', or in Sassetta's *Viaggio dei Re Magi* 'Journey of the Magi' from around 1435).

B) THE DEPICTION OF DISTINCTIVE EMBANKMENTS AND TERRACES BETWEEN 1460 AND 1530

Although the landscapes of the High Gothic period of the fourteenth and fifteenth centuries, as Pächt (2002) somewhat disparagingly said, were still primarily "accessories and wallpaper" to the narrative imagery in the foreground, this changed under the influence of Flemish art in the mid-fifteenth century. The famous view from the window in the landscape of Jan van Eyck (*Madonna of Chancellor Rolin*) of 1435 or the *Miraculous Draft of Fishes* by Konrad Witz (1444) are today considered the first realistic, distinctive landscape paintings. Moreover, whereas the landscape scenes in the late Middle Ages were shaped by rocky terraces, rising steeply behind the figures in the foreground, a first expansion of dimension in terms of width and depth was made by Jacopo Bellini (*San Cristoforo* 'Saint Christopher', in the Parisian sketchbook, 1430–1450). The furrows, boundary lines, and individual trees in this Campagna emphasized a "natural" geometrization, allowing a sense of depth.

Andrea Mantegna, Cima da Conegliano, and the brothers Giovanni and Gentile Bellini were outstanding masters of increasingly expressive landscape paintings: Mantegna (1431–1506) repeatedly used motifs of an agrarian landscape (*Orazione nell'Orto* 'Prayer in the Garden' 1464, *La Crocifissione* 'The Crucifixion' 1459, and *San Giorgio* 'Saint George' 1467). Thus, with his 1455 fresco *Il martirio di San Giacomo* 'The Martyrdom of Saint James', he was the first to create a prototypical hill landscape based on real observations, in which numerous lines, marked by shrubs and trees (fruit trees), ran parallel to the slopes.

Cima da Conegliano (1459–1517/18) presented his landscape scenes in the style of the poetry of Virgil's rural idyll, which united humility, generosity, and simplicity (Villa, 2010). His gentle, colorful paintings reflect a landscape image that corresponds to the Arcadian-pastoral ideal. What is depicted are cultural landscapes dominated by meadows and orchards, but which unlike in Mantegna's work show no clear signs of being farmed, serving nature instead. Field and meadow structures running parallel to the slopes are found in his c. 1495 work, *San Girolamo nel deserto* (Saint Jerome in the Desert).

According to Pächt (2002), Giovanni Bellini's *San Francesco nel deserto* (Saint Francis in the Desert) from around 1485 is the earliest Italian landscape painting (see Figure 1). In the background of the picture, which

is influenced by the Flemish style of painting, there is a castle-like city, under which lie clearly depicted terraces. Cultivated fields with farmers at work are also found in his work *Madonna col Bambino* (Madonna and Child, c. 1510), which was embedded in the familiar landscape of Vicenza. Rectangular, regular fields—likely to have been ordered following a plan, parallel to the slopes and surrounded by hedges—are also recognizable in the background of *Pietà* (c. 1505). A clearly terraced slope can be seen in the left corner of the painting *Cristo al Calvario e il Circeneo* (Christ at Calvary and the Cyrene, around 1460) by the Bellinis. Around the same time, the work *Presepio e altre storie evangeliche e di Santi* (The Nativity and Other Stories of the Gospel and Saints) by Antonio Vivarini appeared, with gently insinuated sloping terraces in the background. This is similar to what can be seen in another painting by Giovanni Bellini (*Cristo nell'orto* 'Christ in the Garden'), where, below the town, hedge structures typical of his style appear, parallel to the slopes.

Farming—considered beautiful, even paradisiacal—became a form of culture with which well-to-do townspeople surrounded themselves artistically. This turn to the rural and thus to one's familiar homeland led not only to agrarian reform, but in particular also to a boom in construction of detached houses, which triggered a first period of urban sprawl. No foreign country, no travel experience, nor new insight was sought; instead, depictions were devoted to nostalgia for one's own land, which at the time was, notably, being traveled by other



Figure 1:* San Francesco nel deserto *(Saint Francis in the Desert) by Giovanni Bellini (1433–1516) (The Frick Collection, New York). Wall terraces cover the mountain slope in the background, to the left.

Europeans (Kiel, Neri, 1952). The Campagna was a cultural metaphor for a human-friendly nature and a contrast to the frightening seas and high mountains, to nature that was uninfluenced and unable to be influenced.

C) THE DISAPPEARANCE OF TERRACED LANDSCAPES

The widely appreciated Campagna ideal of a peaceful, almost garden-like cultural landscape, which was recognized by the locals and loved by the townspeople, underwent a shift in the sixteenth century. This occurred amid political confusion; the end of the humanistic circle of Caterina Cornaro in Asolo in 1509; the military defeat in the battle of Cambrai in the same year, which caused the destruction of the Venetian countryside, considered the familiar Campagna idyll; and the death of Giovanni Bellini in 1516. Thus, the existing Campagna ideal gave way to the Arcadian, moving towards a landscape more strongly influenced by pastoral literature, in which nature was emphasized. This Arcadian motif also contained dramatism and wilderness (e.g., as in *La Tempesta* 'The Storm' or *Il Tramonto* 'Sunset' by Giorgione). Giorgione—like Titian at the beginning of the sixteenth century, but also the painters of the seventeenth century—was driven to paint landscapes for themselves and to "imitate" nature (Kiel, Neri, 1952). Hence, nature was in the foreground; the rural-farming idyll and thus the terraced landscapes retreated (see also Ambroise et al., 1989). This was to an extent due to the influence of Flemish landscape painting, which also used farming village–like motifs (e.g. Brueghel and Bouts), but refrained from depicting terraces because this type of landscape did not appear there.

Terraced agrarian landscapes were closer to the landscape ideal of the early Renaissance than to the Arcadian and sublime nature of the Enlightenment. Thus, in the first landscape depictions of the great Venetian Renaissance painters Vivarini, Mantegna, Bellini, Giorgione, Cima da Conegliano, and Titian, farmland was found fairly frequently (terraced agrarian landscapes, however, only occasionally). They first appear in 1450, disappearing again with the later Renaissance painters in 1520.

D) THE REKINDLED INTEREST IN TERRACED LANDSCAPES AS SEEN IN THE VALAIS

Viticulture in the Swiss Canton of Valais likely goes back to Roman times, and the expansion of the vineyards in the late Middle Ages was already substantial. Nonetheless, the terraced landscapes of the Valais were a rare subject in the widely known paintings of the time, compared to their depictions in the Italian painting of the late Middle Ages and the Renaissance. There are no known representations of terraced landscapes by the first real Swiss landscape painter, Caspar Wolf (1735–1783), nor by the great English Alpine painters, such as John Robert Cozens (1752–1799) and Joseph Mallord William Turner (1775–1851).

Even in the book *Switzerland / La Suisse pittoresque* by William Henry Bartlett, which was published in 1834 in London and contains numerous steel engravings, there are no terraced slopes. The works depict the idealized, untouched nature of the mountain world: mountains, glaciers, forests, rivers, and now and then some shepherds and herds: the Arcadian ideal. This view of the beautiful landscape, focused on nature, collided with that of terraced landscapes as intensively cultivated, regularly structured, fenced-in land. This changed as of the mid-nineteenth century: with the artists of the "School of Savièse," the rural daily life of the Valais mountain population became the focus of attention, also in view of the romanticized urban potential customers in Europe. Gradually, terraced vineyards appeared in paintings, as foreground scenes and in portraits.

The growing artistic interest in the Valais agrarian landscape, in which Campagna motifs can be recognized, cannot be explained without the social changes that took place in parallel. These include the development of tourism and the growing economic importance and expansion in the area dedicated to viticulture. Related to this was the heroization of the winemaker: he appears in almost dwarf-like fashion in the huge theater of steps at dizzying heights, cultivating his vines on the smallest level surfaces wrested from the mountain. Literary depictions played a crucial role in promoting this image.

As in the visual arts, mainly the mountains and primeval nature were the focus of the extensive Alpine literature at the start. Between the sixteenth century and end of the nineteenth century, the manmade terraced slopes between Sierre and Sion, where many commercial travelers, scholars, and writers inevitably passed on their way through the Rhône Valley, were hardly the focus of landscape descriptions. Every now and then, sober and rational mentions can be found, as in this quote from 1600 by the French agricultural scientist, Olivier de Serres (1539–1619): "The earth of mountains or steep slopes is softened by traversing walls, called *bancs* . . . to hold the earth back, and prevent it from sliding down as a result of rain and frequent ploughing" (in Ambroise et al., 1989, 45; translated from French). Also in Rousseau (1712–1778), references can be found to the existence of terraced vineyards (Rousseau, 1978; original: 1761), as well as in the travelogue of the physicist Alessandro Volta (1745–1827; Volta, 1991) or that of Louis Simond (1767–1831; Simond, 1822, in Pitteloud, 2005).

After his professional journey through the Valais in 1885, the French professor of agronomy Victor Pulliat (1827–1896) was the first to describe in detail the individual vineyard locations from Salgesch to Martigny (Pulliat, 1885). Through him, the terraced vineyard landscapes are appreciated more broadly. Moreover, through the tales of the writer Charles Ferdinand Ramuz





Figures 2a/b**: **Edmond Bille, **Vignoble valaisan** ***(Vineyard in Valais), 1918 and the situation today (Photos: Robert Hofer, SL-FP).***

(1878–1947) from Lausanne, terraced landscapes were shrouded in a myth of the happy and self-contained winegrower amid monumental scenery. Thus, in the photo volume *Valais* he describes in minute detail the efforts of the mountain farmers (Ramuz, 1943). Ramuz could therefore also be described as *Monsieur le Paysage en terrasses* (Mr. Terraced Landscape), so deeply did he influence the public perception and appreciation of this landscape form in Switzerland (Rodewald, 2011).

Due to their great economic importance, the terraced vineyards of the Valais were maintained, and they still exist today. As part of the belief in progress and the devaluation of traditional management, many of the original dry stone walls were however torn down in the 1960s and 1970s and the terraces were combined into larger cultivation units; unprofitable vineyards were turned into building land (see Figures 2a/b). Such decisions were determined by economizing cultivation, rather than by aesthetic claims of society. This was associated with a form of sobering up and aesthetic demystification of these erstwhile idealized landscapes.

Interest in terraced landscapes was only rekindled in the 1980s and 1990s. This was based on public criticism of the large-scale leveling of these areas, a changed agrarian policy, model projects, and growing knowledge about the ecological, cultural-historical, and especially aesthetic content of these possibly "perfect" anthropogenic landscapes. The growing consciousness of the values of the terraced landscapes, especially also their aesthetic rediscovery, led to restoration projects that included diverse actors and culminated, for example, in the 2007 entry of the terraced landscape of Lavaux in

BOX 1: VISPERTERMINEN, THE HIGHEST VINEYARD: RECEPTION AND PRACTICAL IMPLICATIONS

"You have heard of the cunningness of pagan wine. Once again the tiny vineyards have planted themselves on top of one another on the little walls. Only here, and then no longer, are they assured of fully ripening. That is perhaps why they want to go higher than anywhere else—there towards Terminen, yonder towards Zeneggen—and they creep deep into the furrowed valley. Nowhere else do the yellow and blue berries ripen sweeter than here, in the glow of the glacial sun" (Gentinetta, 1943, 42, original in German).

Numerous literary sources describe this, especially Charles Ferdinand Ramuz (1878–1947) (1943) and Friedrich Gottlieb Stebler (1852–1935) (1901): the highest vineyard in Europe, the Terbiner terraced vineyards (from *Tärbinu*, the local name for Visperterminen) in the area of Rieben, next to the village of Visperterminen and the hamlets of Ober- and Unterstalden. At an elevation of 650 to nearly 1100 m, the slope traverses about 500 meters in elevation, thanks to numerous high dry-wall terraces (see Figure 3). The Heida growing here is one of the oldest grape varieties of the Valais. The walls turn the steep slopes into small vine-gardens, often no larger than 100 m². The climate is favorable: the slopes face south and the region is the driest in Switzerland. The large stone surfaces of the masonry, and the föhn wind, provide warmth to the Rieben vines until the late autumn.

The newest restoration of fallow plots began in the 1990s with the participation of the municipality of Visperterminen, the St. Jodern Cellars (Germ. *Jodernkellerei*) in Visperterminen, and external actors. When an owner put up his plots for sale in 1998, the initiators seized the opportunity, founding the Heida Guild in 1999 (Heida Zunft, 2016). The board planted 209 vines and offered these for sale as a membership fee: 209 buyers from diverse professions were quickly found. Those in charge made the effort to pass on their complete knowledge about viticulture and traditional management to members unfamiliar with the profession. The members are obligated to help with vineyard maintenance once or twice a year on all plots of the Heida Guild. In return, they receive a bottle of Heida once a year. In 2012, a cooperative was established for the preservation of terraced vineyards in Visperterminen (the *Genossenschaft für den Erhalt der terrassierten Rebberge von Visperterminen* or GTRV; GTRV, 2016); it is a joint effort that enables the professional maintenance of the dry stone walls to continue.

The Heida Guild and the GTRV are examples of how an originally privately cultivated vineyard became common heritage property. The fact that these old vineyards were maintained to the present day is also thanks to their strong valorization through literature and photography (Figure 4).





Figure 3: The vineyards of Visperterminen today (Photo: SL-FP).
Figure 4: Vintage in Visperterminen, 1946 (Max Kettel, Médiathèque Valais – Martigny).

the Swiss Canton of Vaud in the UNESCO World Heritage List. This enabled the preservation of a unique landscape, but for many other terraced landscapes it is too late.

SYNTHESIS: OUT OF SIGHT, OUT OF MIND?

We postulate that the disappearance of Campagna as its own topos of beauty is one of the factors responsible for the loss of this aesthetic side of farming itself, which still describes itself as "agri-culture," but which one-sidedly gave up the humanistic ideal of the combination of leisure, beauty, strength of mind, and contemplation in favor of economic activity and sheer hard work. Thus, there may have been a closer correlation than previously believed between the agricultural development of the plains (towards industrialization, with negative effects on the landscape, biodiversity, soil, and water ecology) and the loss of the Campagna ideal as a delicate balance between the useful and the aesthetic. If ideals of beauty cease to appear, the actual landscape also disappears, as occurred with the erasure of Campagna in the reclaimed river valleys and plains during the course of the nineteenth and twentieth centuries. The land became a hotchpotch of settlements; the ideal of freedom and happiness turned into pure economic purpose. Aesthetic disinterest left farmland to its fate, as a place of intensive production that was damaging to the ecosystem and landscape, or of urban sprawl.

Agricultural terraces for crop production had already disappeared in a creeping process that began in 1800, hardly noticed by the public—in their place came either meadows or pastures, vineyards, or building land. In many places, former farmland was replaced by encroaching forest. Vineyard terraces, however, were retained, due to their greater economic importance, although many of the original dry stone walls were destroyed. The economizing of cultivation dominated decisions; society made no aesthetic claims on these spaces. The once idealized Campagna landscapes, aesthetically demystified, were "out of sight, out of mind." For many of these areas, their aesthetic rediscovery came too late, whereas for others it was their salvation (e.g., for UNESCO World Heritage sites).

We postulate that with a return to the Campagna of old we could lay the basis for a future stronger orientation of agriculture to aesthetic considerations, which is currently often lacking in intensively used production sites. A good example of a more aesthetically oriented cultivation is mountain agriculture, picturesque and loved by tourists, in which the old ideal of Arcadia lives on; another is terraced landscapes, whose aesthetic rediscovery in the nineteenth century—at least where viticulture is concerned—saved them from collapse and disuse (but only partially from intensification of use). Preserving the Geneva countryside (Fr. *Campagne genevoise*) can, for example, to a large extent be attributed to the urban population's continuing city vs. country idealization, which is underpinned by cultural historical foundations (Mulhauser, 2013).

This analysis of the reception of terraced landscapes in art shows that there is a correlation between the aesthetic appreciation of art and literature, and the way society handled landscapes in practice. The vineyard of Visperterminen, Valais, is an excellent example (see Box 1). It would therefore be important, even indispensable, to reestablish this relationship to maintain and emphasize the services for the common good provided by farmers, and to protect important cultural landscapes from being abandoned and trivialized. For this purpose, it is necessary to identify and communicate the aesthetic qualities of agrarian landscapes in general, and of terraced landscapes in particular.

MED CAMPAGNO IN ARKADIJO: SPREMEMBE V DOJEMANJU TERASIRANE KRAJINE V UMETNOSTI IN NJIHOVE PRAKTIČNE POSLEDICE

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POVZETEK

Dojemanje krajine v umetnosti nudi dragocene informacije o družbeno-kulturnem spreminjanju odnosa med resničnimi in idealiziranimi krajinami. V tem prispevku dokazujemo, da je v zlatih časih krajinskega slikarstva v 15. in 16. stoletju prišlo do izrazite spremembe v dojemanju lepote krajine – od kmečke, ruralne idile lepo obdelane krajine (Campagne) k bolj dramatičnemu in simboličnemu arkadijskemu idealu narave s poudarkom na naravnih, gozdnih in pastirskih krajinah. Zaradi tega je estetsko zanimanje za kmečke krajine, zlasti za obdelana terasirana pobočja, upadlo in se znova uveljavilo šele v 19. stoletju. Raziskava temelji na analizi najpomembnejših del krajinskega slikarstva beneške šole, literarnih študijah italijanskega krajinskega slikarstva v renesansi in izvirnih besedilih iz obdobja okoli leta 1500. Spreminjajoče se upodobitve kmečkih krajin obravnavamo v odnosu do dveh krajinskih idealov – Campagne in Arkadije – ter tudi do terasastih krajin švicarskega kantona Valais, ki se kot priljubljena potovalna destinacija pojavlja v številnih likovnih in literarnih delih. Na tej osnovi nato razpravljamo, do kolikšne mere je umetniška upodobitev oblikovala odnos javnosti do krajine. Predpostavljamo, da bi vrnitev k staremu idealu Campagne lahko postavila temelje za večji posluh kmetijstva do estetike, ki je danes na območjih intenzivne pridelave pogosto primanjkuje. Dober primer pridelave, ki v večji meri upošteva estetsko dimenzijo, je slikovito gorsko kmetijstvo, ki ga obožujejo turisti in v katerem še naprej živi starodavni ideal Arkadije. Drug primer, bližji idealu Campagne, so terasirane krajine, katerih estetika je znova pritegnila pozornost v 19. stoletju, kar jih je – vsaj na področju vinogradništva – obvarovalo pred propadom in opuščanjem (a ne v celoti pred intenzivno rabo).

Ključne besede: terasirana krajina, Campagna, Arkadija, kmečke krajine, dojemanje

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THE MOUNTAIN/COASTAL SEA FARMERS AND THE STONE WALLS OF THE TERRACES RESIST THE THREATS TO TERRACED LANDSCAPES AND CULTURES: ITLA—THE INTERNATIONAL TERRACED LANDSCAPES ALLIANCE

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ABSTRACT

The International Terraced Landscapes Alliance (ITLA) is a network of professionals and activists who want to protect, preserve and promote terraced landscapes in worldwide mountain/coastal sea regions. We outline the reasons to get active, explain the threats which the landscapes and its peoples and cultures confront and describe the main activity of International Conferences (China 2010, Peru 2014, Italy 2016) on Terraced Landscapes and Cultures. ITLA creates platforms for the terrace activists to voice their concerns, to dialogue with terrace farmers and constructors for the recovery of local and indigenous knowledge and to formulate defence policies and attitudes to regenerate right livelihoods in mountain/coastal areas by working and living with terraces for healthy food production.

Keywords: terraced landscapes, local and indigenous knowledge systems, mountain farming, international network, world heritage (Tangible – Intangible)

I CONTADINI DELLE MONTAGNE/DELLE COSTE MARITTIME E I MURI IN PIETRA DEI TERRAZZAMENTI RESISTONO ALLE MINACCE NEI CONFRONTI DEI PAESAGGI TERRAZZATI E DELLE LORO CULTURE: ITLA—L'ALLEANZA INTERNAZIONALE DEI PAESAGGI TERRAZZATI

SINTESI

L'Alleanza Internazionale dei Paesaggi Terrazzati (ITLA) è una rete di professionisti e attivisti che desiderano proteggere, conservare e valorizzare i paesaggi terrazzati delle aree montane/e costiere del mondo. L'Alleanza motiva le ragioni della necessità di diventare operativi, spiega i pericoli affrontati dai paesaggi terrazzati, dalle loro genti e dalle loro culture, descrive le sue attività principali come l'organizzazione delle Conferenze Internazionali dedicate ai paesaggi terrazzati e alle loro culture (Cina 2010, Perù 2014, Italia 2016). L'Alleanza crea delle piattaforme di confronto per gli attivisti dei paesaggi terrazzati utili a dar voce alle loro preoccupazioni e al dialogo tra i contadini delle aree terrazzate, tra i costruttori del recupero delle conoscenze locali ed indigene, per formulare politiche di difesa, per rigenerare l'attitudine al diritto alla vita nelle aree montane/costiere resa possibile attraverso il lavoro e la vita con i terrazzamenti per la produzione di cibo salutare.

Parole chiave: paesaggi terrazzati, sistema di conoscenze locali ed indigene, agricoltura di montagna, rete internazionale, patrimonio mondiale materiale ed immateriale

INTRODUCTION TO ITLA

ITLA is the international terraced landscapes alliance founded in China in 2010. The second ITLA international conference was prepared in Cusco, Peru, in 2014 and the third world encounter will be organised in Italy in 2016.

About 50 enthusiasts and visionaries met in Yunnan Province in the Red River Prefecture (Honghe) in November 2010 at the first Conference about Terraced Landscapes (Figure 1). By the end of the conference, some participants formed the *International Terraced Landscapes Alliance* (ITLA) to work for the protection, preservation and promotion of terraced landscapes and related cultures worldwide and they signed the Honghe Declaration (Figure 2). At present, there are more than 100 activists, farmers and researchers from the Americas, Europe, Africa and Asia, who are dedicated to promote the voices of the guardians of the terraces and demonstrate the significance of terraced landscapes for food production. ITLA founders have proposed to make inventories of the existing terraces and show their ecological, cultural and food characteristics on maps; to compile and select annotated bibliography of terraced landscapes and cultures; to undertake case studies about terraced landscapes and cultures; to identify the most experienced guardians, stonemasons and farmers of the terraces and to involve them in the necessary dialogue about knowledge systems essential for the maintenance and construction of terraces and the recovery of biodiversity. Finally, the aim of ITLA members is to engage in actions to preserve, protect and promote the terraces in order that they can recover their role in the history of agriculture of humankind. Members of ITLA are an alliance in favour of supporting the inclusion and voices of the marginalised and powerless farmers, men and women guardians, giving them a fuller life.

What unites activists, farmers, researchers and other members of ITLA? The vision of a future where the guardians of the terraces can continue to enjoy the cultural diversity and biodiversity of their external landscapes and where they are able to transform the internal landscapes of multiple identities. Members unite by a vision in which the guardians can create democratic spaces where they can defend their seeds and crops, their resources like land and water, and their livelihoods, and one which enables the world to hear their voices in Asia, Africa, Europe and the Americas.

Why does ITLA focus on terraces? The ecological conditions of mountain areas have served as one of the natural bases where humans domesticated plants. The prominent Russian botanist Nikolai Vavilov identified eight centres of origin for the domestication of plants in different continents (Vavilov, 1935; Hawkes, 1997).



Figure 1: Yi Terraces from Yuanyang County in Honghe Prefecture in Yunnan, China.

These were areas where a high diversity of domesticated plant varieties and their wild relatives co-existed for thousands of years as a patrimony of humanity. The practices and the knowledge of the local communities about the natural conditions and about the behaviour of plants have contributed to the survival of humanity. The Vavilov centres of domestication maintain their significance as plant conservation spaces until today. Not surprisingly, they often overlap with tropical and subtropical mountain areas, which have both the natural and cultural conditions favourable for plant domestication. These centres are invaluable treasures of humankind, which are endangered by the process of the modernisation of agricultural production and the threats to the rural life. We confront a loss of domesticated plants, but still the potential of wild relatives of food crops survives (Hawkes, 1997).

Local wisdom and practices

Terraced landscapes where humans have cultivated the soil for thousands of years and have domesticated the food crops of humanity are found in all mountainous regions of the world (Donkin, 1979).The terraces were built on mountains, on coastlines and on islands, each one with its own unique wisdom and practice. Each illustrates multiple uses where men and women, the elderly and the young, through the wisdom of their cultural heritage manage the water, the soils and climates in order to nurture biodiversity. Thanks to their particular social organisation and technologies, which have resulted from long-time experimentation over generations combined with local cultural values (reflected also in their food culture), they have constructed these incredible landscapes. Their joint knowledge combines observation, tradition and innovation, and harmonises the dialectics of humans and nature.

Multiple identities

The interior landscape of the guardians, i.e. their identity, is based on their understanding of and dialogue with nature. The soil, the mountains, the rocks, the rain, the spring waters, and the plants and animals form part of the community of living beings. This is particular in each place, for each culture.

The social reciprocity found within the communities, and their dialogue with nature, allow for the evolution of the climate to be communicated through the yearly calendar and over decades from generation to generation. Each year the climate in each place of the world, where terraces exist (arid or humid regions) is special—not one year is the same—and, the local people understand the changes because their lives depend on their knowledge of nature. Each system of terraces constitutes its own universe of dynamic interactions between natural elements and humans and their cultures. The common trait, however, is the vertical management of terraces, which takes maximum advantage of the variability of climates, the changing soils and the adapting plants, which have been domesticated by people in accordance with their needs, interests and creativity. The future of terraces is to continue to produce a diversity of crops with quality—even if in small quantities—to provide a decent and good living.

Right Livelihood and Ways of Life

A healthy life and peaceful rural terraced landscapes are associated values, and are recognised by people



Figure 2: ITLA foundation meeting with 50 terrace lovers and activists.

who do not come from the land. For the locals, agrobiodiversity comes first, and to enjoy good food in accordance with their food culture. Second, local people value exchanging and selling food crops in local markets, an action which reinforces social bonds. The quality of food coming from terraces has an extraordinary value. This is a unique trait for consumers who strive for personal wellbeing.

The young generations learn how to innovate

The mountain communities in these vertical landscapes have generated their own ways of knowing and learning through rituals, ceremonies or social activities. By doing so, the young generations can be incorporated into the culture, and learn the technical and spiritual secrets of dealing with nature, which includes terraces, water, soil and plants. The terrace communities in different continents are as creative and solid as their stonewalls. Even if outside forces repress these communities, and consider them anti modern and enemies of modernisation and development, the communities, like the walls resist and endure. Nowadays even those terraces, which were abandoned, are, after decades, adopted by members of the young generation who seek to live in harmony with nature, and to recover the utility and beauty of the mountain regions. New forms of communities are emerging and these local communities are organising to defend their rights to land and water against the interests of extractive industries supported by "export oriented" political systems.

What mobilises ILTA members? Food Sovereignty (Desmarais, 2010; Nyeleni, 2010) is a basic fundamental human right, which starts with the control over one's own seeds and land. It recognises the decisions of fami-



Figure 3: Doña Flora presents the diversity of maize varieties she is nurturing in Cabanaconde, Arequipa, Peru.

lies and communities to favour their local food cultures as regional traditions, which are linked, in turn, with language and ethnicity. It opposes the threat of globalisation of the food industry and its uniformity (Figure 3).

Members of ITLA aim to create an alternative to mainstream development, one that offers autonomy and self-determination to the local peoples to cultivate their own specific livelihoods. By promoting terraced landscapes in mountain/coastal areas, the rural populations are able to continue their history of sustainable and viable livelihoods for the future and to defend their rights.

METHODOLOGY

The food industry produces an addiction in consumers for processed food, and a dependence among producers for things such as hybrid seeds or GMOs, chemical poisoning linked to expensive credits, promoting export and the predominance of markets. How can we return to the local production of healthy food for local consumers?

What needs to be done?

Make the diversity of terrace production visible. These are the achievements of the guardians of the terraced landscapes, which are small scale and contain special qualities inherent to its traditions. An international movement that is conscious about value and not price needs to be fortified, supporting the space for food sovereignty and the Right Livelihood in each cultural setting (Figure 4), local initiatives, intergenerational dialogue and cooperation, which allows the fulfilment of human beings in harmony with nature (Figure 5). Finally, terrace supporters need to organise itinerant exhibitions, which highlight the threats and the potential of the future of terraced regions, and strengthen local cultures and peasant organisations.

Support the construction of peasant organisations to promote their solidarity, and mobilise them to defend the rights of the terrace guardians and producers against external threats. Doing so will allow stronger identity of the people and strengthen the wellbeing of the terraced mountains.

Have dialogue with politicians with the aim to strengthen the voices and the initiatives of the guardians of the terraces. These spaces of democratic debate and the visibility of peasant knowledge (Figure 6) will lead to the creation of new frameworks to defend the territorial rights of those who preserve and protect the terraces.

Create alliances with conscientious and committed academics. The complexity of terraced systems calls for a multidisciplinary and transdisciplinary approach of the sciences. It stimulates the need to do research differently. It should include the wise farmers. They are the guardians of terraces who have a long history of experimentation, and whose minds resonate with nature and the challenges of the mountains. Issues such as the consequences of climate change should involve young researchers. They are enthusiastic, creative and they will



Figure 4: Terraced landscapes near Paro in Bhutan.

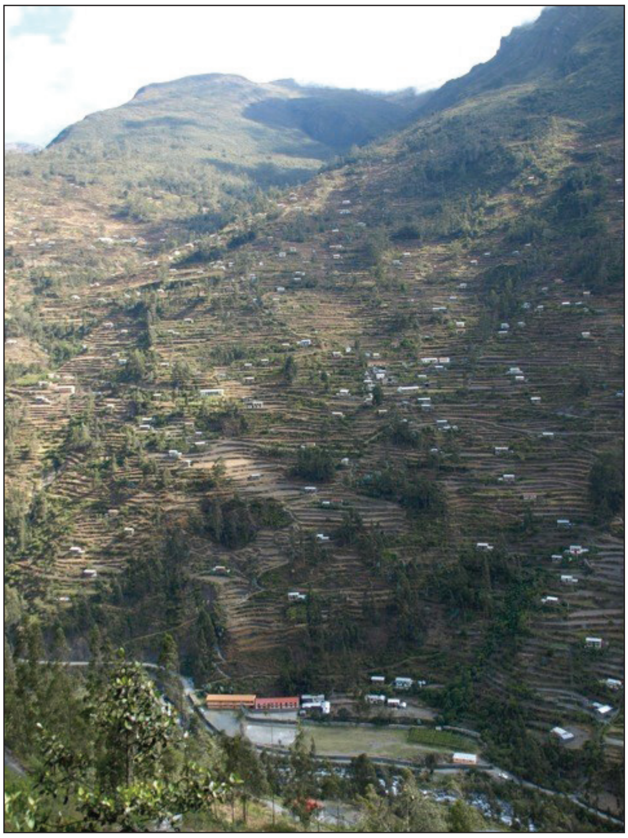


Figure 5: Domesticated Mountains in Sandia, Puno, Peru.



Figure 6: Yi farmer from Red River Valley draws the crops of her fields before the dialogue with the Conference participants—highlighting the role of women of maintaining terraces and biodiversity.



Figure 7: Collecting ideas about the defense of seeds in Cusco.

help to revitalize the ways of knowing of the male and female farmers.

Decolonise our minds. This is a call for revision of the concepts that orient the ideas and policies about mountain/coastal areas coming from different ecological and social conditions, which have influenced the mainstream paradigms. We further need to construct a new paradigm of mountain development based upon the long history of the domestication of plants, animals and landscapes by the traditional societies of the mountain regions.

Organise events like The Second International Conference[1] in May 2014 in Cusco.

Process

The Conference of ITLA 2014 in Cusco had two parts:

Parallel field trips to four different terraced landscapes regions in Peru from May 13 to 18. The trips visited: (i) Yauyos, in the department of Lima, (ii) the southern parts of Ayacucho to the Sondondo Valley, which has an old tradition of building and using terraces, (iii) the areas in the Pampa de Anta near Cusco; and, (iv) the Sacred Valley in the Cusco region. The field trips were organised by local project directors, and the communities that were visited also sent their delegates to the Conference. The participants of the field trips in Peru provided their impressions and results of dialogue with the local communities during the inaugural session of the Conference

The Conference itself, which went from the evening of May 18 to May 22. It began with an Andean spiritual ceremony at the Casa Campesina, where the 80 delegates from Peruvian peasant communities stayed during the days of the Conference, and where they met every evening to discuss their concerns and political positions. These were communicated to the plenary sessions of the Conference, which had up to 280 registered participants.

Methodology and Programme

An interactive and participatory methodology was applied to achieve a process of dialogue between activists, researchers and community members. The program was created using a step-by-step process[2].

Among other activities, conference organisers prepared a three-step Peasant forum.

First, the farmers exhibited food crops from their terraced fields in the different regions; second, there was discussion and dialogue between farmers and other conference participants about the issues identified dur-

1 The organising team in Peru was formed by John Earls from Catholic University, Hilda Araujo, CITPA, Mourik Bueno de Mésquita from Centre Bartolome de las Casas and was supported by ITLA International. During the three years prior to the conference, this team convened large numbers of researchers, and private and public institutions to design and realise the Second International Conference in Cusco. As part of the preparation work, the team organised several workshops with community leaders (male and female) in Cusco to discuss the issues of the terrace farmers in Southern Peru. Their testimonies were presented during the Second International Conference.

2 After the ceremony and welcome toast (Spa. *brindis*) at the Casa Campesina, early next morning the Conference started. The 280 participants arrived at the Municipal Congress Building in the historical centre of Cusco, where were welcomed by two Conch players (Spa. *Pututeros*) from a Quechua community.
In the morning of the first day, we listened to the welcome words by organisers, local authorities and a woman farmer from the Peruvian highland. The organiser (Pei Shengji) of the First International Conference from China detailed the situation of the terraces in his homeland. The Italian organiser of the future conference (Mauro Varotto) gave an overview of the diverse efforts to rehabilitate the terraces in the Italian Alps, and the project leader of the Terraces Project of BID Antonio Lambruschini in Peru introduced the ongoing inventory of terraces in eleven regions of Peru.

ing the preparatory farmer workshops (Figure 7); and, third, identified representatives presented the results of these discussions (Figure 8).

During second and third day, four parallel dialogue tables (Spa. *mesa de diálogo*) were held. Small teams consisting of a coordinator, a facilitator, visualizer and a technician facilitated them. After introducing the methodology and topics, all participants divided into working groups. Each working group presented to the Plenary subsequently with introductory keynote presentations. The latter provided food for thought for the four working groups. These groups were:

1. Water, soils and climate change.
2. Agro-biodiversity and Food Sovereignty and Food Security.
3. Land management, social organisation and local cultures.
4. Traditional and modern technologies and tools.

Each dialogue table went through a sequence of issues related to their specific topic. During the first day, the participants of each dialogue table began by taking a look into the history of each topic, then discussed cases, the present situation, and problems confronted by the local communities. Note the focus of most of the topics was on the situation in Peru, as the majority of participants joined from different areas in Peru. On the second day of the working groups, the participants, according to their origin, drew up their vision of the future of the terraces in accordance with the specific topic assigned to the group, and collected actions which could lead to a sustainable and just use of the terraced landscapes.



Figure 8: Local community member from Tauca explains the representation of the vision of the future of the terraced landscape in Cusco.

The final conference day was divided into three parts:

The participants split again into different subgroups to discuss the results of the previous deliberations in order to contemplate future policies. They then formulated recommendations on policies for water justice, watershed management, science and technology, food sovereignty, world heritage management as well as constructed development models, which would favour peasant economies.

The different subgroups of the conference presented their conclusions in the Plenary.

A formal closing ceremony accompanied by music and dances, as well as with the intervention of Mauro Varotto, who announced the Third Conference to be held in October 2016 in Italy. Outstanding activists from Peru were also honoured.

THE THREATS TO TERRACED LANDSCAPES AND CULTURES

Based on the dialogue with mountain communities in SE-Asia and the PR China, and together with the testimonies of the guardians of the terraces in Peru, Ifugao (Figure 9) and Bali (Figure 10), we have listed and collected a series of threats to terraced landscapes and their cultures. These threats are also valid for traditional societies in other ecological regions, but they are specific to terraced livelihoods. This is because, in mountain areas, the impact may be more extreme, even producing catastrophes, which affect the survival of mountain peoples.

Climate change

The mountain peoples of the world have been able to domesticate the landscape, i.e. by managing soils, climate, water, plants and the human and natural communities, for their survival and wellbeing. Their predictions of the climate were based on long-time observation of nature in the reduced spaces of mountainous micro-climates (Tillmann, 1997). This was the key for being able to experiment, domesticate, produce and survive as human beings and as also as ethnic cultures. Climate change affects the capacity of the rural communities and their indigenous experts to predict the climate, and to cultivate successfully their terraced fields within a range of variability of the climate. Recently, the climate has turned unpredictable. The mountain dwellers feel that is more extreme. There are droughts which kill the crops, torrential rains which produce flooding and landslides, and frost and hail which destroy the young cultivars. The usual signs found in nature read by the farmers, and their knowledge about the agricultural calendar no longer coincides with

the reality of the fields. However, fortunately, the terraced landscapes provide special advantages regarding climate change when compared with agriculture in flat lands and slopes, both of which are affected seriously.

Extractive industries and mining companies

The impact of the extractive industries on the lives of terraced communities is both harmful and disastrous. Traditional agricultural systems are affected when the mines usurp water resources and contaminate the locally produced food crops by polluting the irrigation water. This in turn harms not only the health of local villagers, but also urban consumers. Often the mining companies take away the water because they have more economic power, and can influence authorities who propose exporting minerals as solution to national development needs. In the process, they neglect the needs of the small rural populations whose electoral votes do not count. Terraces in local mountain communities require intensive labour. However, when the mining companies enter an area they hire people, both men and women. Especially the younger villagers abandon their fields in order to receive low wages. If the community opposes the concessions of the mining companies, the companies use many different mechanisms to convince the members of the community (Spa. *comuneros)*. They bribe authorities; attack strong leaders, even to the point of killing them or their family members; establish contracts with the community and give them low paying jobs; and offer financial support to build the social infrastructure needed to modernize the mountain communities. Sometimes they even contract anthropologists to convince the villagers to accept this "invasion" phrased in the cultural terms of the villagers. In exchange, the terraced landscapes are debilitated, the healthy, traditional food production declines, and the market with its junk food invades the local food culture.

Social organisation and migration

As the urban official systems marginalize rural communities, and promote urban development and modernization, there are few incentives to stay in rural areas. This situation is even worse in mountain areas with terraces.



Figure 9: Batad in Ifugao, Philippines. Proud villagers show their terraces.

This is because terraced landscapes require adherence to a strict agricultural calendar and their maintenance is very labour intensive. Terraced agriculture traditionally requires a young labour force as well as the creative intelligence of the female seed keepers. Terraced agriculture cannot be mechanised easily. Community members are now migrating and young people search for jobs in the cities or in industrial agriculture and abandon the villages in remote mountain areas. Elderly people, and often more women and children, stay behind. They are less able to maintain the systems that produce the food from the fields. The social organisation weakens, and traditional wisdom fades as the generational links are broken.

Seed erosion

The agricultural traditions are affected by the invasion of modern seeds, technological packages of the green revolution and a weakened ecology. Local wisdom (Figure 11) fades away and the urban consumption transforms the local food cultures and weakens the nutrition of rural families. Traditional plant varieties and animal races linked with the ethnic cultures in the mountain valleys are lost, and the agro-biodiversity is depleted. Family agriculture is no longer a priority in official policies, which now prioritises agro-exports.

Chemical agriculture and mechanisation

Chemical agriculture refers to the fertilisers and pesticides that were invented after World War II as an option for the arms industry to reutilise their chemical weapons for the production of food (Carson, 1962). The US government in particular established agricultural extension systems with former army members to promote chemical agriculture as part of a policy of development and growth (Tillmann, 1994). This affected the health of producers and of consumers because water, air, and food were polluted with harmful chemicals. As the chemicals destroyed the natural capacity of the soil to produce tasty and healthy food, the natural production systems of family farmers were weakened and even destroyed. In addition, agricultural development coming from the North imposed mechanisation to free the labour force for industrialisation. However, this resulted mainly in creating slums and poverty.



Figure 10: Sacred landscape in Bali.

In terraced landscapes, mechanisation destroys the terraced fields; their well-designed irrigation systems, the family mode of production, and affected the natural qualities of the terraced fields. For example, the wine terraces of *Kaiserstuhl* in Germany were restructured but they show less defence against frost attacks, because the terraces are wider than those built in the traditional way. Family labour was replaced by farm specialists, and farms become dependent upon external inputs, for example, petroleum. If the terraces are dismantled, soil erosion sets in, and this debilitates the mountains.

Money and market

The link to the market economy affects negatively traditional cultures and local production systems. Instead of producing food for self-consumption and local markets, the local communities are transformed into folkloric elements for tourism expecting monetary gifts, which, in turn, eliminates family food production. Global markets require uniform and constant production in huge quantities, which destroys agro-biodiversity. Money forces migration to the cities, and weakens intergenerational cooperation. Money corrupts the authorities; profit interests exploit and depress the natural resources, which are traditionally in hands of the local communities. The rich gain from the poor who have no power.



Figure 11: Mountain farmers Flora and Martina meet in Cabanaconde, Arequipa, to exchange seeds and with coca leaves share their knowledge and perform a ritual.

Colonised minds and Domination from outside forces

Governments and development projects institute development models far away from the needs of local communities. Policies are designed in the cities and the world centres of development where the policy makers are disposed towards growth, industrialization, and modernization. Traditional ethnic societies are perceived as an obstacle to Western type urban, industrial and scientific development. The transnational industries fund and control the generation of knowledge, and influence the agendas of agricultural research and the interests of science. By doing so, they create options, values and visions which are alien to and against the local people. There is no intercultural dialogue in development, the ideas and proposals are unidirectional, and one-sided; local people are instrumentalised and subjected to the monologue of outsiders, and to the transfer of technologies and models. Dominant systems colonise the communities with their models (Ngugi wa Thiong'o, 1981). The formal education systems, and, finally, public opinion and the media reject traditional lifestyles and food cultures. Development imposes investment projects that do not benefit the mountain people, but instead increase the profits of industries. Rational and positivist science denies the dialogue between humans and nature which is found in traditional cultures, and denies the spirituality of the respect for Mother Earth and for all living beings like plants, animals, landscapes, mountains. This dominant system threatens the survival of life on planet Earth (Escobar, 1995; Gudynas, 2011).

The history of mountain valleys

The history of mountain regions is filled with the imposition of values and attitudes derived from an external rationale. Development and societal models are imposed, no dialogue occurs about the future visions of local people, and the opinions of the indigenous and rural communities are not included in the design of their own future by urban planners. External political and economic powers occupy their land, displace their habitats, fields and crops, and destroy their traditional ways of life, producing the poverty and destitution of the majority. . Development projects come, and leave again. They propose, and often impose, their modernisation schemes. They divide local communities, create parallel organisations, and manipulate, facilitate or even instrumentalise their ideas, knowledge within their own external logic.

DISCUSSION - CONTINUING WITH ONGOING AND MUTUAL LEARNING

The terraces are diverse with collective uses worldwide. They represent an inexhaustible source for learning and inspiration.

The main achievement of the Second International Conference on Terraced Landscapes[3] was that the women and male farmers of the Andean communities of Cusco, Puno, Arequipa, Tacna, Abancay, Ayacucho and Lima became the protagonists of the Conference. They organised the Terraces Exhibition, intervened in the Peasant Forum, and within the dialogue tables expressed their ideas and concerns on equal standing with the professional participants. In this way a dialogue was possible.

Their conclusions were growing since the first workshops in the two years before the Conference and their debates were critical to come up with motivating ideas to protect and to promote the terraced landscapes in Peru. They proposed to start at individual and family level to involve the younger generation to learn the techniques, rituals and values of terraced agriculture. At the community level the farmer participants will mobilise the communities and their local education systems to value their natural resources and their food culture.

At the national level the Peruvian farmer delegates proposed to organise themselves as a Federation of Terraced Communities whose objectives are to: stop damaging policies; defend their rights with support from outside organisations (NGOs, lawyers, activists); work with scientists for the rehabilitation of traditional crops (seeds) and the reconstruction and revival of abandoned terraces.

Internationally, the national delegates of terrace communities want to be linked to other movements and farmers worldwide. They further want, if possible, to participate in ITLA 2016 in Italy in order to have the chance to exchange their concerns, interests and experiences with fellow communities in other parts of the world.

Follow up

The Peruvian ITLA group agreed to undertake the following activities in advance of the 2016 conference:

- Strengthen the organization of the Peruvian ITLA which right now has only 20 members.
- Support the terraced communities of Peru to organise a Terraces Defence Committee or a Federation of Communities to voice their concerns and defend their land and water rights against external aggressions.
- Continue collating the bibliography of publications on terraced landscapes in Peru.
- Take note of the efforts of the official terraces program of Agro rural and the inventories of terraced areas in Peru.
- Collect information about ongoing activities, for example, the school of terrace constructors. This school has both a manual and instruction video produced by the Cusichaca Trust and supported by IDB (Interamerican Development Bank)
- Support young researchers and student groups to produce case studies about terraces, and to do volunteer work in communities interested in rehabilitating and promoting their historic terraces
- Support the organisation of ITLA 2016 in Italy, and stay linked to the international cooperation team and the Italian division of ITLA.

Ongoing learning

The next, Third International Conference on Terraced Landscapes in Italy will provide a powerful impetus for international efforts to protect and value terraced landscapes, a special inside look not only in Italy—a country that is widely characterized by terraced landscapes, dating back over hundreds and of years—but in the surrounding countries of the Mediterranean and of central Europe. It offers participants from other continents a profound insight into the remarkable heritage of terraced landscapes in Italy and in Europe. The Italian Branch of the International Terraced Landscape Alliance was legally founded in November 2011 in Arnasco (Savona) following the First International Conference on Terraced Landscapes held in Yunnan Province of the People's Republic of China. Our five founder bodies are the Cooperativa Olivicola di Arnasco (SV), Arnasco Municipality, Consorzio della Quarantina (GE), Veneto Region and University of Padua. The Association has a continuously growing number of associate members who represent—through their personal status as citizens, farmers, artisans, public and private institutions, associations and researchers—the multidisciplinary richness linked to terraced landscapes.

The Italian Branch of the Alliance believes in the active implementation of the Honghe Declaration and in the sharing of its commitment—to keep alive the interest in terraced landscapes—through offering to become a point of national reference for gathering the vast existing, diverse traditional knowledges; the written and audiovisual documentation. Through promoting the inventory of terraced landscapes at national levels; organizing workshops with farmers, activists, researchers, supporting and disseminating good practice case studies about terraced landscapes and communities. The central topic for the next conference on Terraced Landscapes and Cultures is *Choosing the future* about the "Future of Right Livelihood of terraced landscapes worldwide, observing, analysing and sharing experiences on Agri-Culture, Food and Peasant livelihoods". Participants will study the perspectives of ecology, landscape and food qualities, as well as the social and economic models for a sustainable future of the terraces and its people. The aim of the conference is to map the values of terraced landscapes, highlighting the combination of technological and cultural traditions with scientific, economic and social innovations towards local and global policies for

3 The results of the Second International Conference on Terraced Landscapes have been published by the organising team with funding support from JICA (Japanese International Cooperation Agency) (Tillmann, 2015).

the recuperation, protection, preservation and promotion of terraces in the mountains of the world.

CONCLUSION

The participants, activists, ITLA members and others will get acquainted with the situation of terraced landscapes in Italy and Europe. This will enable the work methodology, which combines interactive conference sessions, exchange of experiences in a visual form, dare-to-share fair and dialogue with the specialists, debates in small groups, workshops and village conferences. Field work and dialogue will be held with local communities in different regions of Italy. Ten regions and thematic workshops are foreseen:

- Triestean Coast—Ecology and Biodiversity;
- Topolò-Dordolla—Artistic and cultural communication;
- Canale di Brenta—Agronomic and social innovations;
- Valpolicella & Valdobbiadene—Quality of Food, Quality of life;
- Trentino—Rules & Policies;
- Ossola—Construction and Maintenance Techniques of Dry Stone Walls;
- Alto Canavese-Valle D'Aosta—Landscape and Tourism;
- Chiavari-Lavanga-Vernazza in Liguria—Environmental and hydrogeological risks;
- Ischia & Amalfitana Coast—Heritage and historical rural landscapes;
- Island of Pantelleria—Water harvest, resilience and arid agriculture.

These sites will illustrate a diversity of problems, potential, and uses of terraces. During the conference, deliberation, an exchange of experiences, and the collection of proposals for action at local, national, regional and global levels which favour the future wellbeing of terraced landscapes, societies and cultures will take place.

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KMETJE V GORAH/OB MORJU IN KAMNITI ZIDOVI TERAS KLJUBUJEJO NEVARNOSTIM, KI OGROŽAJO TERASIRANE POKRAJINE IN KULTURE: ITLA – MEDNARODNA ZVEZA TERASIRANIH POKRAJIN

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POVZETEK

V prispevku je predstavljen proces, kako je nastala ITLA – Mednarodna zveza terasiranih pokrajin, kakšni so njeni cilji, kdo so njeni člani in kakšne so prednosti terasiranih pokrajin v gorskih regijah/na obalnih območjih po svetu. Terasirane pokrajine so ne le najpomembnejša območja, kjer so se rastline prilagodile, ponekod ekstremnemu, podnebju, ampak so tudi območja kmetovanja v malem obsegu, ki ga kmetijski poslovni krogi zanemarjajo in ki je potisnjeno na obrobje vladnih politik. Obstoj terasiranih pokrajin ogrožajo številne nevarnosti, zaradi katerih prihaja do njihovega opuščanja: podnebne spremembe, industrijsko kmetijstvo in njegove škodljive tehnologije, migracije mladih ljudi v mesta zaradi večjega trga dela, onesnaževanje rudarskih in drugih ekstraktivnih industrij. ITLA si prizadeva s posebno metodologijo organizacije mednarodnih konferenc doseči priznanje bogatega lokalnega znanja o terasirani pokrajini in njeni biotski raznovrstnosti, o izvirnem in iznajdljivem načinu rabe pobočij ter o izraziti skrbi kmetovalcev in graditeljev teras za ohranitev terasirane pokrajine. Cilj skupnega delovanja tako kmetovalcev kot znanstvenikov in vseh drugih je vzpostavitev skladnega svetovnega akcijskega načrta, ki vključuje številne elemente, za promoviranje terasirane pokrajine in njenih kmetijskih kultur, ki pomembno prispevajo k ublažitvi posledic podnebnih katastrof, ter obnova prehranske suverenosti za tisoče pridelovalcev in porabnikov hranilne in kulturno sprejemljive hrane v zadostni količini in primerne kakovosti. Delovanje članov mednarodne zveze naj bi prineslo spremembo sodobnih predstav o terasirani pokrajini, ki so pripeljale do njenega opuščanja, obnovo terasnih tehnologij in kultur na terasah ter opustitev pojmov, ki temeljijo na razvojnih modelih neoliberalizma (gospodarske rasti in privatizacije). Vse to je mogoče doseči s spodbujanjem dialoga z lokalnimi kmetovalci, s pomočjo katerega se lahko spremeni dojemanje terasiranih pokrajin in prizna pomen lokalnega znanja, ki temelji na stoletjih vzajemnega delovanja z naravo.

Ključne besede: terasirane pokrajine, lokalni in avtohtoni sistemi znanja, gorsko/priobalno kmetijstvo, mednarodna omrežja, svetovna dediščina (oprijemljiva - neoprijemljiva)

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REDUCING CLIMATE AND OTHER RISKS THROUGH NATURE-AIDED AND FAITH-BASED EXPERIENCES BY PERUVIAN TERRACE FARMERS

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ABSTRACT

Terraced landscapes and irrigation systems help the Andean farmer partially write-off certain climatic risks. To predict climatic events he uses nature-based indicators. His harvest still face the risk of being wiped out by a severe frost or a plague. Hoping to reduce all such farming risks, he performs rituals to appease the deities of Andean cosmovision, expecting them to reciprocate and bring him a decent harvest. We present a summary of these ancestral practices, collected through extensive on-field interviews of expert farmers from central and southern Peruvian Andes.

Keywords: Andean agriculture, climatic risks, bioindicators, plant diseases, plagues, rituals, ancestral knowledge

RIDUZIONE DI RISCHI CLIMATICI E DI ALTRO TIPO CON METODI NATURALI E APPROCCI BASATI SU ESPERIENZE RELIGIOSE PRATICATI DA AGRICOLTORI PERUVIANI SU COLTIVAZIONI A TERRAZZA

SINTESI

Terrazzamenti e irrigazione sul loro lotti aiutano il contadino andino per rimuovere parzialmente determinati rischi climatici. Lui usa gli indicatori della natura per predire eventi meteorologici. La sua raccolta è ancora soggetta ad essere spazzata via da un gelo duro o parassiti. Sperando di ridurre i rischi agricoli, si esibisce in rituali per placare gli dei della creenza andina, sicuri che, in cambio, essi permetteranno di avere un buon raccolto. Presentiamo una sintesi di queste antiche pratiche, riportata in ampie discussioni con esperti nel campo dell' agricoltura andina del Perù centrale e meridionale.

Parole chiave: agricoltura andina, rischi climatici, bioindicatori, fitopatie, piaghe, rituali, conoscenze ancestrali

INTRODUCTION

The Andean climate varies significantly as one ascends its steep hills. However, the elevation alone cannot define the climate of an Andean farm plot. Over 5000 km long and over 5000 m high Andean range, consisting of several parallel chains, encompasses a substantial fertile and arable landscape where many millions make a living out of agriculture. This mountain range separates extensive masses of humid air from both the amazon basin and the Pacific Ocean, but inserts a narrow, bone-dry desert between these two, setting up a very complicated weather system. Finding a geographical niche in the Andes with a regular, annual rainfall pattern is nearly impossible. The variation of temperature is a bit more predictable, even though extreme hot or cold fronts may appear abruptly, bringing frost or hail storms at any time.

The Andean farmer has learned to survive in this harsh climate, cultivating many different products at as many different ecological niches as he can gain access to (Murra, 1972). This practice does not reduce the risk of loss in each plot, but avoids the total loss of food and seeds and provides him with a cushion to survive until the next harvest.

Wherever possible, he also attempts to modify his farming landscape, by preparing terraces, for example. A bench terrace with a stone facing would help him control the frost at macro and micro levels (Denevan, 2001). On one hand, the cold air descending the slope would be broken-up by the stairs-like terracing. On a micro level, the heat absorbed by the stone wall during the day warms up the air around the plants during a freezing night. In addition, a terrace reduces soil erosion to a minimum; helps infiltrate the rain or irrigation water; and maintains the moisture longer in soil.

Irrigation water, if available full time, would provide another layer of protection against unpredictable weather: keeping the furrows full of water reduces the damaging effects of a short frost attack on young plants; sprinklers could wash ice-laced leaves before a bright sun would burn them. On the Andean Pacific flank, where yearly rainfall could be less than 50 mm, irrigation water acts as farmer's lifeblood. Even in other areas, if the rains come late, irrigation could save at least a part of the production.

However, a three to four days long frost, a hailstorm, a heavy rainfall or a lasting drought could still destroy the farmer's entire food production, leaving nothing even for seeds. Apart from these, a farmer family faces many other uncertainties. A farmer never knows how many seeds she planted would germinate. Plagues and plant diseases may attack not just one plot, but a whole region. An accident at work or any other health problem of a family member could incur heavy financial burdens, causing difficulties in organizing the farm work at precise occasions. Yet, the greatest risk of farming lies in the selling price of the marketable harvest, as intermediaries control it completely.

How would you add a layer of safety to a farmer's life, engulfed in so much uncertainty? In rural Peruvian indigenous communities, farming is practically a collective activity. A farmer may possess a few hectares of arable land in total, but that is usually the sum of many small patches of land, spread out over various ecological niches in and around the village, each surrounded by the plots of her neighbors. A hailstorm or a plague attack would affect not just a couple of farmers but almost everybody in the community. Hence, she can summon the collective wisdom of her neighbors to reduce the risk of such incidents, or to minimize the damage from them. This vast pool of resources, enriched over generations of shared farming experiences in the same locality, incorporates observational knowledge of nature-based indicators and ritualistic appeals to deities for help.

INVESTIGATIVE METHODOLOGY

This paper summarizes certain aspects of ancestral agricultural expertise, collected from small, rural farmers in central and southern Peruvian Andes. *Asociación Andina Cusichaca*, a Peruvian NGO, gathered these testimonies as a part of a project sponsored by the Peruvian Ministry of Agriculture and the Interamerican Development Bank. This project intended to promote ancestral agricultural practices among young *campesinos* (farmers) through a field school where the testimonies of expert farmers would form a teaching tool.

Since the colonization of the Americas, the authorities have suppressed and condemned ancestral practices and knowledge systems of the farmers, because farming in the colony had a new meaning: that is, producing wealth for the hierarchy. The independence did not change the attitude towards farming, only it changed the oppressors. Over the last few decades, this oppression took a new form: in the name of modernization, government technical extension officers began to impose upon the farmers "green revolution recipes" while continuing to condemn ancestral practices. This long history of subjugation caused the loss of a good part of this ancestral knowledge. The farmers who still practiced it had no incentive to reveal that information. Gaining their confidence was the key to access this treasure.

However, the vast coverage area of this particular project and the short time period allocated for field visits made it very difficult for our research teams to gain the confidence of the farmers. Besides, we wanted them to not just provide the information, but also be directly involved in running the agricultural field school. We proposed to the Ministry that the school should be conducted not by technical officers, but by expert farmers themselves, in their own farm lots. Because of time and budget constraints in reaching remote municipal districts, picked by the Ministry of Agriculture, we also

requested that its extension officers accompany us on our field visits. When Ministry officials presented us to large gatherings of village farmers, we did not collect the testimonies in public. Instead, we asked them to name a group of expert farmers, with an aptitude towards teaching the young, irrespective of their level of formal education. We wanted that group to take us on a short tour of agricultural fields, so that we can collect testimonies on site.

Even though the farmers received us with trepidation, being a part of a government program, the idea of using farmers as teachers in this school apparently coincided with their own thinking, and we won their confidence right away. Besides, the technical personal with strong farming backgrounds who led our research teams could quickly put the farmers at ease, greeting them the traditional way, and in their own languages. Having at least one female member in each team also facilitated gathering information from women.

The interviews were of semi-structured nature, which allowed us to modify the questions depending on the expertise of a particular informant. It helped maintain the fluidity of the conversation and permitted us to press for more details only when the situation warranted.

USE OF BIOINDICATORS TO PREDICT THE WEATHER AND THE HARVEST

The farmers use their observational and memorizing skills to interpret nature-based indicators and predict local weather patterns during the coming agricultural campaign. The scientific method, that uses historical trends of measured values of weather components, is too unreliable to forecast weather beyond a few days because of the interdependency among many of these components. Thus, even the most experienced meteorologist, armed with the state-of-art equipment, would not dare attempt an agricultural-campaign-long prediction.

Yet, the Andean farmer's bag of tools has several advantages over that of the meteorologist. She has access to a wealth of information, handed down to her by past generations, on what happened to agricultural production as a whole (not how individual elements in weather equations varied), analyzed using specific signals from a large set of indicators. All those observations would have originated from the exact region over which the prediction is made, while the meteorologist is forced to extrapolate his data from many distant points. The farmer's set of indicators involves daily observable celestial

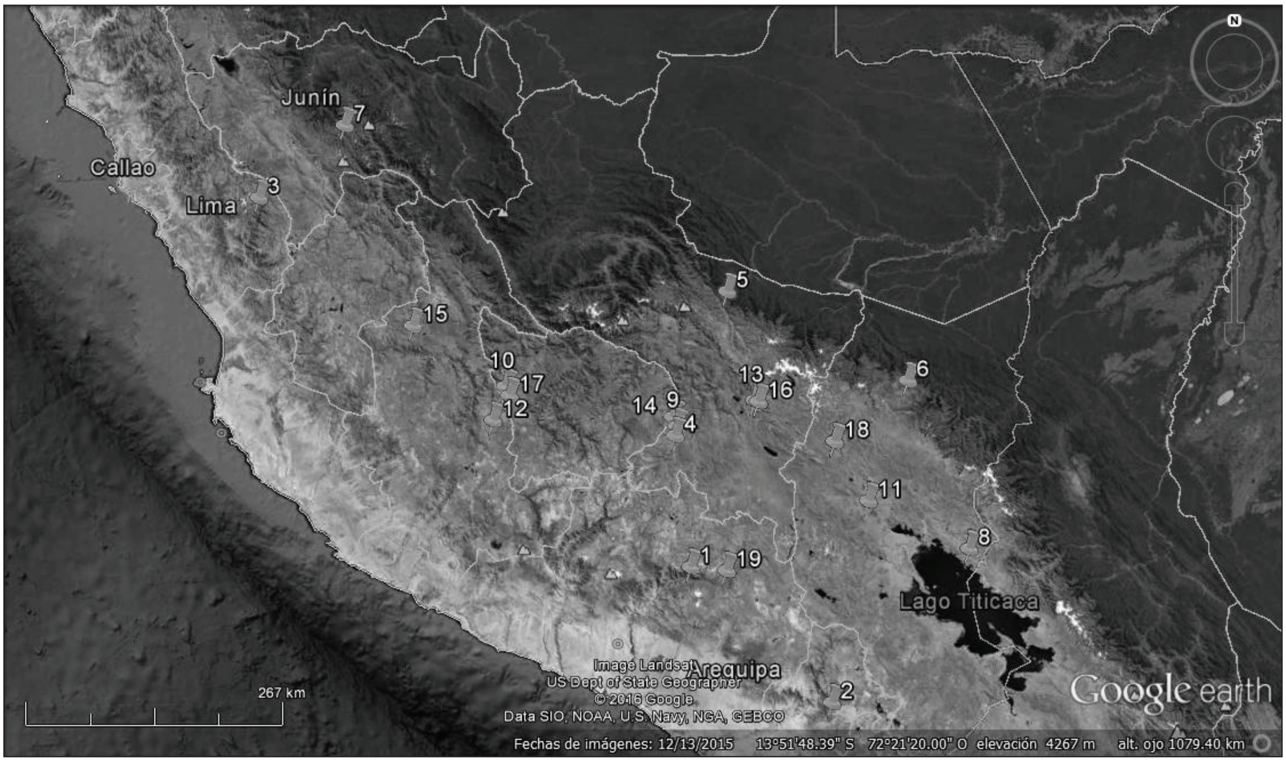


Figure 1: Map of the Peruvian communities mentioned in the paper
1. Cabanaconde, 2. Cambrune, 3. Carania, 4. Ccoyo, 5. Challabamba, 6. Coasa, 7. Comas, 8. Conima, 9. Lutto, 10. Paico, 11. Pucará, 12. Qarwarasu, 13. Queromarca, 14. Quiñota, 15. Quispillacta, 16. Raqchi, 17. Soras, 18. Urqhuararapampa, 19. Yanque.



Figure 2: Ritual for mountain deity in Apu Qarwarasu (Courtesy of Mr. Adripino Jayo, Ayacucho, Peru).

elements, certain climatic phenomena and many types of animals and plants, including the crops themselves.

"If rain falls slowly throughout the day on the 8th of March, we can expect a good potato production during the agricultural season starting in September. Heavy rains on that day may signal floods. Similar weather on March 19 will confirm that prediction. If a mist engulfs the hill slopes on the 19th, plots in the slopes would yield better harvests than those in the plains" (CHUYMA ARU, 2007, 32 & 34). Conima, Moho Dist., Puno, Puno[1].

"If Pleiades (a cluster of stars) appear bigger and brighter early in the morning of June 24th, a good harvest will accompany us" (AAC, 2015, 8). Coasa Dist., Carabaya, Puno.

"If *Laqu* (an algae - *Spirogira*) appears with a lot of flowers, we can expect a good year" (CEPROSI, 2009, 42). Queromarca, Tinta Dist., Canchis, Cusco.

"If the fields are covered with the bluish Tankar flower, the *haba* beans (*Vicia faba*) will yield a good harvest" (AAC, 2015, 9). Pinchollo, Cabanaconde Dist., Caylloma, Arequipa.

"When the *zorro* (fox - *Lycolapex Inca*) cries out with a clear voice, he signals a bad year for potatoes. If he cries as if his mouth is full of food, a good season can be expected" (AAC, 2015, 9). Yanque Dist., Caylloma, Arequipa.

The village wise men interpret and compare hundreds of such signals to understand not just the weather, but also which crops will yield better harvests and where. Since not all the signals appear before land preparation time, they keep watch on them until the planting time. Some signals also indicate whether to plant earlier or later in the season to reduce climatic-anomaly-related losses.

1 The testimonies are attributed to the whole community when several experts from the same place were consulted. The location is given in the order: community, district, province and region, based on Peruvian political administrative system. If a location is given starting with the name of the district, the experts reside in the district capital. To precisely locate an address, use the listings of Peruvian political divisions.

"We watch the weather on the first three days of the month of August. If clouds or rains appear on the very first day, early season planting will produce better results" (AAC, 2015, 39). Quiñota Dist., Chumbivilcas, Cusco.

USE OF RITUALS TO PREDICT HARVESTS AND TO PROTECT CROPS

A few communities still maintain ritualistic crop trials that help them decide what crop to plant and when.

"On a special day in September, we ritually plant all types of crops at a sacred site near the spring that feeds our canals. That site is divided into three equal parts, each representing a particular planting season (early, normal or late). A year later, all the local authorities take part in the ceremony to harvest the crops at that location. The results of this trial allow everybody in the province to decide which crop to grow and at what planting season, in order to maximize the harvest in the year to come" (AAC, 2015, 10). Lutto, Llusco Dist., Chumbivilcas, Cusco.

When severe weather conditions threaten every family's food stocks, the community acts together, seeking help through rituals to save the agricultural campaign.

"When the rains get too late, the elders used to bring out the remains of our ancestors from the caves, and hang them by the bridge. Rains follow soon after" (AAC, 2015, 21). Comas Dist., Concepción, Junín.

"If a drought persists, we visit a remote spring, plead for help from our deities and bring that spring water to the community in special pots. We then ceremoniously marry that water off to an unnamed bride in the community. At the end of the ritual, we offer food to a group of small kids, and the rains come" (Chambi, Chambi, 1995, 64). Conima, Moho Dist., Puno, Puno.

"To cultivate, we depend entirely on rains. Every year, we visit a virgin lake with a gift package (black guinea pig and other things). As we bring that water to the community, the first rains accompany us. If not, we repeat the trip. If we get too much rain, we plead the deities to put a stop to it, by ceremoniously tightening a sacred cord around that pot of water." (AAC, 2015, 47). Coasa Dist., Carabaya, Puno.

Occurrence of heavy frost or hailstorms also forces farmers to perform rituals to appease or frighten these climatic phenomena, thus hoping to reduce damages to the crops. To establish a way to communicate with these phenomena, the farmers weave a story, converting them to humans, but with special powers.

"*Chicchi, Huayra*, and *Ccasa* were three lazy brothers, who lied to their mother and showed a neighbor's plot as the one where they worked on. She got into trouble with the neighbor while harvesting there. Back at home, she poured her fury on them, converting them to frost, wind and hail" (AAC, 2015, 71). Mr. Quintin Flores H., Ccoyo, Santo Tomás Dist., Chumbivilcas, Cusco.

"When the frost comes, we keep a cooked *chuño* (freeze-dried potato) dish on the stove. Frost stops at this prepared food and does not steal our crops" (AAC, 2015, 72). Coasa Dist., Carabaya, Puno.

"When the hail clouds gather overhead, we send up a powerful fire cracker. The horse that carries hail on its back gets scared and runs away" (AAC, 2015, 73). Quispillacta, Chuschi Dist., Cangallo, Ayacucho.

COHABITING WITH PLAGUES AND DISEASES

Andean farmer treats diseases or plagues not as an attack on her particular plot, but as an issue to be dealt with the community as a whole. First, she tries to understand why they suddenly appear in-force in her community. A commonly occurring disease is treated as just another neighbor: its resurgence could be the punishment for a wrong committed by some people in the community. Experienced elders deliberate as to why this neighbor (disease) got angry and what would correct the wrong. A ritual allows them to establish a conversation with it, plead guilty on behalf of the offenders, and reinforce everybody's commitment to live in harmony with all the neighbors. Once you accept the guilt, you also accept the punishment (the crop lost). The farmers then try to appease the offended neighbor with gifts or a feast to minimize further damage (Machaca, Machaca, 1994).

"Once my pigs started dying young. Splitting lips prevented them from eating. In my sleep, the disease appeared as a neighbor pleading for food. I killed a big animal, offered every neighbor a fat piece of meat, and the problem disappeared" (Machaca, Machaca, 1994, 67). Mrs. María Machaca, Quispillacta, Chuschi Dist., Cangallo, Ayacucho.

A rare pest or a plague is treated as a visitor to the community, trying to establish a foothold there or looking for a refuge. Instead of launching a wholesale attack against the visitor, the community performs a ritual, creating an opportunity to hear his needs. They try to satisfy him offering what they can, and then ask him to leave, without causing much damage (Machaca, Machaca, 1994).

"In 1991-92 an army of insects attacked our *haba* beans very bad. We organized a big send-off feast, and asked each farmer to gather about 30 of those insects. We loaded them onto a well-decorated raft and floated them off in Lake Titicaca, with a lot of food. Our *habas* recovered" (Chambi, Chambi, 1995, 57). Mr. Pedro Mamani M., Conima, Moho Dist., Puno, Puno.

CEREMONIES TO ENSURE A SUCCESSFUL AGRICULTURAL CAMPAIGN

Rituals and feasts are not limited to such special circumstances. From the time the Andean farmer prepares the plot until the harvest is stored, she converses continuously with her deities and tries to placate them through celebrations.

"*Pachamama* (mother earth) is a living person. We owe her a lot for all that we receive. For every farm activity, we should get her permission and keep her content, so that we can work with no accidents. You may spread a lot of fertilizer in the plot, but if you offer *pachamama* nothing, there is no guarantee that you will have a good harvest" (AAC, 2015, 28). Mrs. Martina Mamani A., Raqchi, San Pedro Dist., Canchis, Cusco.

"Each deity has her mission. One is in charge of the harvest; another brings us light but constant rain, without ruining the land; the wind has its own deity. The one that provides water for irrigation is the most powerful of all" (Chambi, Chambi, 1995, 61). Mr. Félix Apaza Q. & Mrs. Eugenia Pacoricona A., Conima, Moho Dist., Puno, Puno.

"Before preparing the land, we ask an elder to put together an *ofrenda* (gift package): coca leaves, incense, cereals of various colors, an animal fetus, chicha drink, etc. He invokes the deities offering the gift, pleads them to give us a good harvest and ceremoniously places the offer in a special niche in the plot" (AAC, 2015, 28). Mrs. Elsa Cárdenas C., Pinchollo, Cabanaconde Dist., Caylloma, Arequipa.



Figure 3: Ceremony for **Pachamama** *(mother earth) in Soras Dist., Sucre, Ayacucho (Courtesy of AAC, Lima).*

"The spirits of the wind could be sleeping under the rocks that you may want to use for the terrace wall. So, to avoid accidents, get permission from them first. If people were buried in your land in the past, you must placate the ancestors with a gift and they will help you succeed in your work" (AAC, 2015, 29). Mrs. Martina Mamani A., Raqchi, San Pedro Dist., Canchis, Cusco.

"On the day of planting, men offer coca leaves and flowers to *pachamama* (mother earth), but do not intervene anymore. The women select three pairs of big and well-formed *ispallas* (seeds), energize them with coca leaves, flowers and other sacred items, and then begin planting with those" (Chambi, Chambi, 1995, 56). Mr. Felix Apaza Q. & Mrs. Eugenia Pacaricona A., Conima, Moho Dist., Puno, Puno.

"Ceremonial activities on the day of planting end in a game: one participant acts as the seed-stealing *zorrino* (*Conepatus chinga suffocans* - Molina's Hog-Nosed Skunk) while others try to throw corn powder to make him go blind" (AAC, 2015, 39). Comas Dist., Concepción, Junín.

"Before harvesting, we welcome the new corn in the field itself, burning incense with aromatic herbs, so that it goes into the storage full of energy" (CEPROSI, 2009, 89). Queromarca, Tinta Dist., Canchis, Cusco.

"On January 20th, our community organizes a ceremony, so that the remnants from the last harvest of potatoes can meet the first pickings of the new crop and transfer them the responsibility of feeding the farmer family. Since ancient times, what we now call Carnival has been an event to celebrate the flowering of crops and the arrival of new farm products" (AAC, 2015, 81). Mr. Zenón Gómel A., Pucará Dist., Ayaviri, Puno.

"Twin corn cobs have a special place in the ceremonies. When we dry the corn seeds, we place those twin cobs in the middle, adorned with a crown made of *molle* (*Schinus molle* - Peruvian pepper) branches, accompanied by incense and herbs" (AAC, 2015, 83). Cambrune, Carumas Dist., Mariscal Cáceres, Moquegua.

"Ancestral practice tells us to select seeds during the waxing moon" (AAC, 2015, 83). Mr. Toribio Huilca Y., Challabamba Dist., Paucartambo, Cusco.

"The woman carries the sole responsibility of selecting the seeds. The man should not even enter the storage room" (AAC, 2015, 83). Carania Dist., Yauyos, Lima.

"In the past, *troje* (corn storage container) was organized very carefully. You put heavy rocks at the bottom and place flower-decorated twin corn cobs around them. On one side sits a decorated pot containing grains of all types and colors, and on the other side, a bottle of wine. The newly harvested cobs go on top of all that.

Rats never entered that container" (AAC, 2015, 87). Mrs. Flora Chuquicondori A., Cabanaconde Dist., Caylloma, Arequipa.

DISCUSSION

Farming practices based on bioindicators and rituals, such as those discussed above, have been probed and accepted as valid by generations of agricultural experimenters. These complement a myriad of technological practices (to be discussed in a separate paper in the future) adapted to local conditions. Their success in producing nutritious food in sufficient quantities under harsh Andean environment needs no more proof than the fact that such agriculture survived over five centuries of culturally and politically adverse systems of government.

These cultural practices vary from region to region, as well as from village to village. Each household continues to use these, along with hundreds of other secrets it inherited from the past. Generally, details of these processes are not disclosed in public. Some farmers fear losing the benefits of the rituals if explained to outsiders. Others fear that the "civilized" would laugh at them (van Kessel, 1997).

Juan van Kessel (1997) summarized the cosmovision of Andean farmers that gave rise to these ritual practices. Its pillars are: 1) complementarity: that no living being is completely self-sufficient and everybody needs the help of the neighbors to survive; and 2) reciprocity: such help needs to be mutual and no one should expect to receive and receive without giving away anything. As Mrs. Martina Mamani from Raqchi explains, *Pachamama* (mother earth) represents the good neighbor that helps reduce the risks in a farmer's life. The package of *ofrenda* (gift package) the farmer offers to the deities at the beginning of the campaign symbolically represents her willingness to share the benefits she expects to receive from her plot. That willingness is affirmed through many food feasts she offers to her neighbors and to local children, at various stages of the farming calendar during the year.

According to van Kessel (1997), the *chacra* (farm) is the central platform through which the deities, nature and humans interact: communicating the needs and warnings to one another; and exchanging gifts and benefits. To make that conversation real, the Andean farmer tries to bring the deities and other beings down to her world, make them a part of her community. When faced with the threat of drought, Conima farmers make the water deity their *yerno* (son-in-law) celebrating a community marriage ritual. That way, the help is guaranteed, as no son-in-law would let the relatives down, under a situation of hardship. The story that Mr. Quintin Flores of Ccoyo weaves to "humanize" the wind, frost and hail, paints them as mischievous village kids. They are not inherently bad, nor will steal from the neighbors, but are simply asking help to satisfy their needs. Gomel (1997) uses the same story while explaining how the contemporary farmers in his native Pucará



Figure 4: Preparation of an ofrenda (gift package) before planting corn, in Paico Dist., Sucre, Ayacucho (Courtesy of AAC, Lima).

area survive such climatic extreme events. The practices used to reduce the damages there vary somewhat from those in terraced farming regions, because Pucará District (in Ayaviri, Puno) tends to face very severe frost and hail attacks.

Enríquez Salas (1997) provides a list of climatic bioindicators used by the villagers of Urqhurarapampa (Nuñoa Dist., Melgar, Puno) in their agricultural practices. Being a native of the area, he could gather such information in full detail. The indicators in our list coincided with those of Urqhurarapampa, except for that of the *zorro* (*Lycalopex Inca* - South American fox). When its cry is clear and uninterrupted, these villagers interpret that the coming agricultural season would be productive, especially for potatoes, their number one product. They should know better, compared to the villagers from whom we gathered our data, in Yanque Dist, Caylloma, Arequipa, who specialize in corn.

Mr. Nestor Chambi P., born in the district of Moho, Puno, illustrates through testimonies (N. Chambi, 1997) the complete process of identifying plant plagues caused by insects, possible reasons for their occurrence, and rituals and other acts performed by the villagers there to reduce such damages. The information we gathered from various regions does not have the depth of the data from Moho, but the reasoning behind the rituals and the way they are performed generally agree.

CONCLUSION

Farming in the Andes is not just a simple exercise of fertilizing the land, planting and harvesting. Modern agricultural technologies have continuously suffered failures in the face of highly variable climatic conditions here. Over millennia, severe Andean weather has pushed the farmer to seek alliances with natural and divine forces to reduce the risks. She has developed a large set of bioindicators to predict long-term crop production, so that she can achieve a decent harvest manipulating many options of lands, crops and timeframes available to her. She should also appease the divine agents, in every step of the way to the harvest, because they expect her to reciprocate, not just receive the benefits.

Except for a pilot project on predicting weather using bioindicators, conducted in collaboration with the Batallas municipality of Bolivia, academic and government authorities continue to ignore that universities and technicians have a lot to learn from Andean farmers. Government extension officers should be trained to listen, grasp and complement farmers' technologies. Government agricultural institutions should help safeguard this ancestral knowledge and disseminate it among regions where such wisdom has been wiped out. With such support, the Andean farmer can retake the lead in provisioning the world with sane and safe food.

ZMANJŠEVANJE PODNEBNIH IN DRUGIH TVEGANJ PO IZKUŠNJAH PERUJSKIH TERASNIH KMETOVALCEV, KI TEMELJIJO NA NARAVNIH POJAVIH IN NA VEROVANJU

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POVZETEK

Zaradi težav, ki nastajajo pri ugotavljanju rednega letnega vremenskega vzorca na katerikoli lokaciji, je kmetovanje v Andih zelo tvegana dejavnost. Kmet lahko zmanjša del tega tveganja z uporabo terasiranih zemljišč in z namakanjem. Kljub temu je njegov pridelek še vedno izpostavljen skrajnim vremenskim razmeram. V tisočletnih obdobjih je perujski kmet zbral obsežno zbirko kazalcev, ki temeljijo na naravnih pojavih. Ti podatki kmetovalcem omogočajo napovedi, katere pridelke je potrebno gojiti na katerih lokacijah in v katerih letnih obdobjih, da bi dobili najboljše donose. Andska kozmovizija je pridelovalce naučila tudi, da božanskim silam ponudijo darila in v zameno pričakujejo vračilo, ki je preprečevanje negativnih učinkov vseh življenjskih negotovosti. Poleg tega izkušen kmet uporablja številne tehnološke pristope*, ki so se na določenih lokacijah že v prejšnjih generacijah izkazale za učinkovite. S povečevanjem preseljevanja mladih ljudi s podeželja in državnimi spodbudami uporabe agrokemičnih sredstev pri kmetovanju je ogroženo ohranjanje znanja prednikov. Raziskava prinaša pregled samo na naravnih pojavih temelječih napovedi o postopkih kmetovanja in pregled obrednih verskih aktivnosti v kmetijstvu, ki so zbrani v obsežnih terenskih pričevanjih* strokovnjakov *v perujskih Andih. Metodologija zbiranja modrosti prednikov je potrjena s primerjavo naših podatkov z informacijami, ki so jih zbrali raziskovalci, ki so imeli dostop do bolj poglobljenega znanja na določenih lokacijah.*

Ključne besede: andsko kmetijstvo, klimatska tveganja, bioindikatorji, bolezni rastlin, kuge, rituali, znanje prednikov

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IGNORED REGIONS: SLOVENIAN TERRACED LANDSCAPES

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ABSTRACT

Research, academic studies, civil initiatives, important recognitions, and various documents about terraced landscapes have intensified in recent decades. This is proof that awareness about terraced landscapes is growing at the global, European, and national levels. Research, academic studies, and civil initiatives have taken place in Slovenia as well. This study determines how many municipalities in Slovenia contain terraced landscapes, and it reviews documents at the national level (laws and strategies) and local level (spatial documents) to determine whether and how they refer to terraced landscapes. Surprisingly, global and international trends and Slovenian research on terraced landscapes have not affected national and local documents with regard to themes specifically addressing terraced landscapes. Because Slovenian terraced landscapes have too many important values to remain ignored, we propose a procedure enabling institutions at the national and local levels to acknowledge their existence.

Keywords: terraced landscapes, national strategic documents, spatial planning, spatial municipality plan, Slovenia

REGIONI TRASCURATE: PAESAGGI TERRAZZATI DI SLOVENIA

SINTESI

Negli ultimi decenni si sono intensificate le ricerche, gli studi accademici, le iniziative civili, i riconoscimenti importanti e la produzione di vari documenti relativi ai paesaggi terrazzati. Questo dimostra che la consapevolezza di aree terrazzate sta aumentando sia a livello globale ed europeo sia su quello nazionale. Le relative ricerche, gli studi accademici e le iniziative civili hanno avuto luogo anche in Slovenia. Lo scopo del presente studio è stato stabilire quanti comuni sloveni comprendono paesaggi terrazzati, ed esaminare documenti a livello nazionale (leggi e strategie) e locale (documenti sulla gestione dello spazio) per determinare se e come essi si riferiscono a paesaggi terrazzati. Sorprendentemente, le tendenze globali e internazionali, nonché le ricerche slovene su aree terrazzate non hanno influito sui documenti nazionali e locali relativi a temi che affrontano specificatamente le aree terrazzate. Siccome i paesaggi terrazzati in Slovenia hanno comunque troppi valori importanti per essere ignorati, proponiamo un procedimento che permetterà alle istituzioni a livello nazionale e locale di riconoscere la loro esistenza.

Parole chiave: paesaggi terrazzati, documenti nazionali strategici, pianificazione territoriale, piano di gestione dello spazio comunale, Slovenia

INTRODUCTION

Awareness of terraced landscapes is growing considerably at the global, European, and national levels. Research, academic studies, civil initiatives, important recognitions, and various documents about terraced landscapes have intensified in recent decades. For example, researchers and professionals are also paying increasing attention to terraces in China, the world's most populous country and the world's second-largest country by land area, because two-thirds of China consists of mountains, high plateaus, and hills with many terraces (Junchao, 2015).

The most important civil initiative on the protection, preservation, and promotion of terraced landscapes and related cultures worldwide is the International Terraced Landscapes Alliance (ITLA), formed during the first world conference in 2010 in China. Farmers, researchers, activists, and others involved in ITLA are dedicated to promoting the significance of terraced landscapes. National branches of this civil initiative were also formed, such as the Italian branch, which is preparing the Third International Conference on Terraced Landscapes in 2016 (Terraced Landscapes: Choosing the future, 2016). Associations dedicated to dry stone walls, built without any mortar or cement, in various countries such as the UK, Canada, and Australia "promote greater understanding and knowledge about the traditional craft of dry stone walling" and "encourage the repair and maintenance of dry stone walls throughout the country" (DSWA, 2015). Similarly, civil initiatives have also emerged in Slovenia (as well as initiatives within or based on European projects) dealing with dry stone walls, such as the latest initiative for the preservation and promotion of karst dry wall construction (Partnerstvo kraške suhozidne gradnje, 2016).

Terraced landscapes have been recognized at the global and European levels. Since the new cultural landscape category was introduced in 1992 for potential world heritage sites, six terraced landscapes have been listed as UNESCO World Heritage Sites (Peters, 2015). "The Rice Terraces of the Philippine Cordilleras is an outstanding example of an evolved, living cultural landscape that can be traced as far back as two millennia ago in the pre-colonial Philippines" and was added to the list in 1995 (UNESCO, 2015a). The cultural landscape of the province of Bali in Indonesia consists of rice terraces and their water temples and is a result of the *subak* system as a manifestation of the *Tri Hita Karana* philosophy (UNESCO, 2015b). It was added to the list in 2012. Spectacular terraces of the cultural landscape of the Honghe Hani rice terraces were acknowledged in 2013 (UNESCO, 2015c). Recently, the cultural landscape of southern Jerusalem in Battir, a land of olives and vineyards, was identified as a representative of an outstanding example of a landscape (2014; UNESCO, 2015d). Two European terraced areas can be found on the UNESCO list. In 1997, "Portovenere, Cinque Terre, and the Islands (Palmaria, Tino and Tinetto)" was added to the UNESCO World Heritage List (UNESCO, 2015e); Cinque Terre is a belt on the northeastern coast of the Ligurian Sea in Italy. The Lavaux vineyard terraces along the south-facing northern shores of Lake Geneva were added to the list in 2007 (UNESCO, 2015f). In these terraced landscapes, not only the terraces themselves are protected and safeguarded, but also the "intangible culture and knowledge of the people that create them" (Peters, 2015). Slovenia has established the Register of Immovable Cultural Heritage, which also includes some terraced landscapes and mentions the cultural landscape, such as the Jeruzalem Hills near the village of Jeruzalem (Register of Immovable Cultural Heritage).

The Honghe Declaration (2010) is a significant document on terraced landscapes at the global level, drawing attention to their condition and supporting the commitment to maintaining interest in terraced landscapes. "The European Landscape Convention of the Council of Europe promotes the protection, management and planning of European landscapes and organises European co-operation on landscape issues. . . . It covers all landscapes, both outstanding and ordinary, that determine the quality of people's living environment" and "provides for a flexible approach to landscapes whose specific features call for various types of action, ranging from strict conservation through protection, management and improvement to actual creation" (European landscape convention, 2015). The EU's Common Agricultural Policy (CAP) included cultivated terraced landscapes in the Rural Development Policy 2007–2013 as Less Favored Areas (LFA) and in its agricultural biodiversity action plan (to improve or maintain biodiversity and prevent its decrease due to agricultural activities). The preservation and maintenance of terraced landscapes is also among the priorities of the thematic strategy for soil protection (Lasanta et al., 2013).

Documents at the Slovenian level present a challenge examined in this article. The study reviews these documents (various legislation and spatial documents) at the national and local levels to determine whether references are made to terraced landscapes in them and what kind of context they are cited in. In parallel, a study has been conducted to determine how many local municipalities in Slovenia contain terraced landscapes. Because cultivated terraces have fairly strongly (and in some places even predominantly) characterized the landscape in many parts of Slovenia, we propose a procedure allowing institutions at the national and local levels to acknowledge their existence.

RESEARCH ON TERRACED LANDSCAPES

The significance of terraced systems and research on them has been confirmed by two world conferences on terraced landscapes, held in 2010 (China) and 2014 (Peru). The two conference publications cover various themes related to terraced landscapes and they also

address research on terraced landscapes. In the second conference volume, Junchao (2015) reports on thirty years of field investigations in China, which have been a basis for a long-term plan to develop terraced regions. In Peru, research has been carried out on terraces since 1981 for the entire country, urban areas, and hydrographic areas. At all of these scales, researchers are dealing with inventorying and restoring terraces, promoting agricultural products and biodiversity, the use of terrace systems in promoting agricultural tourism, and other topics (Morales & Saboga 2015). Studies at the European level on inventorying, preserving, restoring, and planning terraced landscapes have also been conducted; at least nine were carried out between 1990 and 2008 (SIG 2009), including the following:

(1) The PROTERRA project (1997–2001, Lécuyer, 2006; *Les systèmes de terrasses: définitions, outils et méthodes d'approche*, Tatoni, 1996) dealt with dynamic rehabilitation of the cultivated terraces that characterize the Mediterranean area. The approach started with the finding that the identity of the landscape is based on traditional cultivars—thyme, lavender, grapes, and olive trees—and that the heritage restoration of agricultural areas must be associated with the establishment of young professional farmers to develop the original production systems (Fleury 2003).

(2) The RERTC project (1997–2001, *Restauration, entretien et revalorisation des terrasses de culture*) defines the problems of cultivated terraced landscapes in human terms: How can one convince local companies that the culture of terraced areas is important? What kind of motivations do farmers need to maintain terraced systems? What are the new economic opportunities for these traditional areas (Mediterranean Centre of Environment)?

(3) The PATTER project (1999–2001) describes the methodology of terraced heritage for cultivated terraces on the Spanish island of Majorca and in areas surrounding Nice and Genoa (Project PATTER, 2002).

(4) The TERRISC project (2004–2006) explores the preservation of terraced landscapes as a strategy for preventing natural disasters, especially floods and erosion, on the Balearic and Canary Islands, in Portugal, and in southwestern Europe (Martin, 2006).

(5) The ALPTER project (2005–2008, The Terraced Landscapes of the ALpine Arc) reviewed the degradation of agricultural terraces caused by agricultural abandonment in the Alps and the possibilities for rehabilitating these terraced spaces (ALPTER, 2015). In the ALPTER project, for the first time one of the partners studying terraced systems was from Slovenia (ALPTER, 2015a). This partner also prepared the plan and constructed new terraces in the settlement of Medana.

One national research project has focused entirely on terraced landscapes in Slovenia. The basic goal of the project Terraced Landscapes in Slovenia as Cultural Values was a complex interdisciplinary assessment of terraced landscapes across the entire country (Terraced Landscapes in Slovenia as Cultural Values, 2016).

Studies of terraced landscapes have greatly expanded lately, although an overview of these studies is lacking (Varotto, 2014). Research projects at the global and European levels have similar research themes. The literature concentrates on identifying terraced systems, their technologies, and their social organization; on research about natural hazards, land degradation, and conservation; on studies of the development of terraced landscapes, their role in agricultural production, and food security; on tourism development and promotion; and on policies, regulations, and management for preserving terraced landscapes and their functioning. In the past, studies in Slovenia have concentrated on reporting the extensive abandonment of cultivated terraces in the Koper Hills and Gorizia Hills (Vrišer, 1954; Melik, 1960; Titl, 1965); on terrace construction methods following the development of agricultural technology and terrace construction methods using agricultural machinery (Colnarič, 1971, 1985, 1991; Škvarč, 1999; Vršič, Lešnik, 2001; Škvarč, Kodrič, 2007); and on terminology connected with terraces and old viticulture techniques in villages in the countryside around Koper from the mid-nineteenth century to the 1950s (Presl, 1995).

The partnership between the University of Ljubljana's Faculty of Architecture and the ALPTER project led to a decisive turning point in research on terraced landscapes in Slovenia. The articles were published on terraced landscapes (Ažman Momirski, 2008), terrace construction (Ažman Momirski, Berčič, 2007), manuals of construction techniques for terraces (Ažman Momirski et al., 2007), geomorphology (Petkovšek et al., 2008), land use (Petek, 2008), and risk assessment (Komac, Zorn, 2008). An international conference entitled Living Terraced Landscapes held in Ljubljana at the conclusion of the ALPTER project demonstrated that more experts deal with terraced landscapes than is immediately apperent (Living Terraced Landscapes, 2008). After attempts to review all terraced landscapes in Slovenia, including their typologies (Ažman Momirski, Kladnik, 2008, 2009, 2012) such studies expanded (Križaj Smrdel, 2010). Continued research on Slovenian terraced landscapes provided the motivation for a volume on terraced landscapes at the regional scale of sub-Mediterranean Slovenia (Ažman Momirski, 2014).

DATA AND METHODOLOGY

Selecting various methodologies was necessary for the purposes and aims of this research. First, when surveying local municipalities in Slovenia that contain terraced landscapes, we used LIDAR hillshade back-

Table 1: Data for selected municipalities and pilot areas.

Municipality – terraced area	Municipal area (km^2)	Pilot area of the terraced landscape (km^2)	Terraced landscape within the pilot area (km^2)	Terraced landscape within the pilot area (%)
SEŽANA — MERČE	217.4	3.92	0.26	6.63
TOLMIN — RUT	382.33	10.17	0.36	3.54
TREBNJE — DEČJA VAS	163.31	3.06	0.51	16.67
VELIKE LAŠČE — VELIKA SLEVICA	103.18	1.14	0.27	23.68
ŽELEZNIKI — SMOLEVA	163.79	1.83	0.12	6.56
ŽIROVNICA — RODINE	42.58	1.81	0.24	13.26

ground data (LIDAR, 2015), the borders of the local municipalities in Slovenia, and land-use data (GERK, 2015). Changing the layer visibility by turning layers on (displayed in the plan, map, or image) or off (not displayed in the plan, map, or image) affects the data representation. Combining different layers provides flexibility, control, and the opportunity to identify information about specific features in the plan, map, or image. Using the method of changing layers made it possible to present the results below.

National documents under review were the Waters Act (ZV, 2002), the Construction Act (ZGO, 2004), the Nature Conservation Act (ZON, 2004), the Spatial Development Strategy of Slovenia (OdSPRS, 2004), the Environmental Protection Act (ZVO, 2006), the Agricultural Land Act (ZKZ, 2011), the Promotion of Balanced Regional Development Act (ZSRR-2, 2011), the Resolution on the Strategic Orientations of Development of the Slovenian Agriculture and Food Industry in 2020, "Zagotovimo.si food for tomorrow" (ReSURSKŽ, 2011), the 2012–2016 Slovenian Tourism Development Strategy (SRST, 2012), and the Strategic Plan on Implementing the Resolution on the Strategic Guidelines for Agricultural and Food Industry Development by 2020 (SURSKŽ, 2014).

The documents chosen at the local level were municipal spatial plans (OPN). The OPN is determined by the Spatial Planning Act (ZPNačrt, 2007) and defines the responsibilities of municipalities in spatial planning: determining the objectives and guidelines for spatial development of the municipality, determining the land use and conditions for the placement of spatial development, and planning spatial arrangements of local importance. The municipal spatial plan contains strategic and operative parts. The strategic part of the municipal plan defines the background, objectives, and concept of the spatial development of the municipality; guidelines for urban development and complete renovation; guidelines for developing the landscape, determining land use and spatial implementation conditions, and designing public infrastructure of local importance; settlement areas, including areas of dispersed construction, which are spatially connected; and scattered settlements. Implementing the municipal spatial plan for individual spatial planning units provides the area of land use, the spatial implementation conditions, and areas for which to prepare detailed municipal spatial plans. The municipal spatial plan is the basis for preparing projects for obtaining building permits under construction regulations.

The selection of municipal spatial plans reviewed was not random because the selected municipalities have pilot areas of great importance with regard to terraced landscapes, which were already analytically processed in previous studies:[1] Žirovnica–Rodine, Tolmin–Rut, Trebnje–Dečja Vas, Velike Lašče–Velika Slevica, Železniki–Smoleva, and Sežana–Merče (Table 1).

The selected terms examined in documents at both the national and local levels in the first step were *terrace*, *terraces*, *terraced landscape*, *terraced area*, and *terraced slope*. In the second step, the documents at the both national and local levels were reviewed for the terms *landscape*, *landscapes*, *landscape* (adj.), *cultural landscape*, and *agricultural landscape*.

The methodology followed to ensure that the research was up to date used the following process (Oliveira, 2015): downloading the latest version of the documents as PDF files from their original sources; using the command "find" in the Acrobat reader program; and scanning page after page to extract the section, paragraph, and sentence in which the terms are noted. Ten national documents and six local documents were scanned. This process made possible concise and direct analysis by involving not only the words identified but also their context. A summary of the findings is presented in the tables and descriptions.

The methodology for the proposal is based on different territorial levels. The first level covers the entire municipality. Following the Spatial Planning Act (ZPNačrt, 2007), spatial units are formed in the spatial plan of the municipality, covering the entire territory of the municipality. The spatial units must be set exactly, determining their boundaries on the ground and in the cadaster. Therefore, the second level, which is more detailed,

1 This research was partly funded by the Slovenian Research Agency through the applied research project "Terraced Landscapes in Slovenia as Cultural Values" (no. L6-4038), in which eight pilot areas were selected and examined.

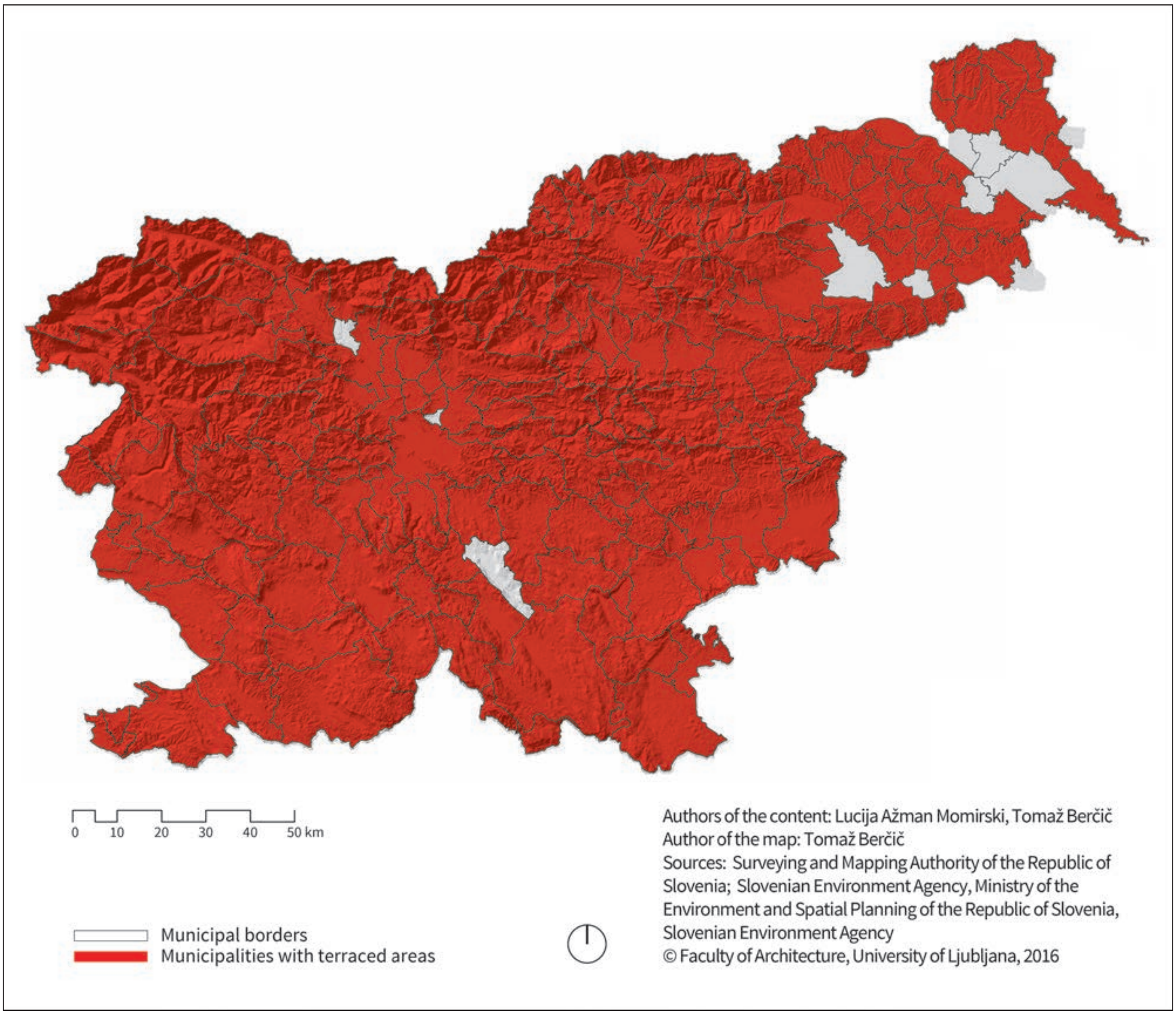


Figure 1: Local municipalities in Slovenia with terraced landscapes.

covers the cadastral unit or settlement. Finally, we highlighted features of terraced systems for a single plot.

RESULTS

Reviewing all Slovenian territory, we found only nineteen municipalities (out of all 211 municipalities) without terraced landscapes, which altogether accounts for 3.3% of the country's entire territory (Table 2). It is necessary, of course, to note that the presence of terraced landscapes in the municipalities is not uniform: in some municipalities, where the major part of the territory is flat, there may be only a few terraces on not very steep slopes at the edge of the municipal territory (borderline cases were included in the category of municipalities with terraced landscapes); in other municipalities, terraced landscapes may be the dominant landscape feature (Figure 1). Both active (i.e., cultivated) and abandoned terraces were considered in the review.

The review has also shown very interesting relief typologies, which can be observed through such analytical work. For example, terraces in high mountains just below the ridges mainly have wide terraced platforms with a strong gradient, irregular plan, and extremely low terraced slopes—however, because of the falling slope, these terraces have great heights. In contrast, terraces at the foot of the hills, which are often low, have medium-wide terraced platforms and an almost equal height of the terraced slope and terrace. There are also uniform, regular, higher terraces with only a few centimeters of gradient of the terraced slope, and therefore again an identical height of the terraced slope and terrace.

An analytical review of the national documents (Table 3) shows that first selected terms are mentioned only

Table 2: Local municipalities in Slovenia without terraced landscapes.

Municipalities without terraced areas	Municipal area (km²)	Percentage of Slovenian territory
BELTINCI	62.25	0.31
ČRENŠOVCI	33.69	0.17
DOBREPOLJE	103.15	0.51
HAJDINA	21.82	0.11
KIDRIČEVO	71.50	0.35
KOBILJE	19.74	0.10
KRIŽEVCI	46.25	0.23
MARKOVCI	29.84	0.15
MIKLAVŽ NA DRAVSKEM POLJU	12.54	0.06
MURSKA SOBOTA	64.43	0.32
NAKLO	28.29	0.14
ODRANCI	6.93	0.03
SREDIŠČE OB DRAVI	32.74	0.16
STARŠE	33.97	0.17
TIŠINA	38.82	0.19
TRZIN	8.62	0.04
TURNIŠČE	23.84	0.12
VELIKA POLANA	18.67	0.09
VERDEJ	12.02	0.06
Sum	**669.09**	**3.30**

in the Waters Act (ZV, 2002; *terraces* once), the Agricultural Land Act (ZKZ, 2011; *terraces* twice) and in the Strategic Plan on Implementing the Resolution on the Strategic Guidelines for Agricultural and Food Industry Development by 2020 (SURSKŽ, 2014; *terraces* three times and *terraced* area once).

The Waters Act (ZV, 2002) specifies that, in landslide areas where water phenomena and the geological composition of the soil pose a risk to the land or slope stability, owners of the land should not encroach on the land in such a way that this encroachment triggers the movement of hillsides or puts the stability of the land at risk in any other way. In such areas it is not permitted to construct terraces, which would retain the water.

The Agricultural Land Act (ZKZ, 2011) mentions terraces under the paragraph on improvement of agricultural land. "Improvement of agricultural land includes measures that improve the physical, chemical, and biological properties of the soil and improve access to agricultural land. Improvement of agricultural land includes leveling land, removing bushes and trees, landfills on fertile land, removing isolated rocks, creating field roads, creating and removing terraces, creating mountain and karst pastures, installing minor drainage, adding lime to the soil, and long-term fertilization." Terrace construction ranks among major land-improvement measures.

The Strategic Plan on Implementing the Resolution on the Strategic Guidelines for Agricultural and Food Industry Development by 2020 (ReSURSKŽ, 2011) defines terraces as land of ecological importance. The guidelines for achieving strategic and development objectives in viticulture and winemaking also specify agro-environmental and climate payments (KOPOP) in the second pillar under the Rural Development Program (2016) for terraced land, which is identified with preventing erosion, maintaining vineyards on steep slopes, reducing the impact of natural disasters, preserving cultivated farmland (preservation of cultivated areas up to 5,570

***Table 3: National documents scanned for the terms* terrace*,* terraces*,* terraced landscape*,* terraced areas*, and* terraced slope.**

Documents	Keywords				
	terrace	*terraces*	*terraced landscape*	*terraced areas*	*terraced slopes*
ZV (2002)	0	1	0	0	0
ZGO (2004)	0	0	0	0	0
ZON (2004)	0	0	0	0	0
SPRS (2004)	0	0	0	0	0
ZVO (2006)	0	0	0	0	0
ZKZ (2011)	0	2	0	0	0
ZSRR-2 (2011)	0	0	0	0	0
ReSURSKŽ (2011)	0	0	0	0	0
SRST (2012)	0	0	0	0	0
SURSKŽ (2014)	0	3	0	1	0

***Table 4: Local municipal documents scanned for the terms* terrace*,* terraces*,* terraced landscape*,* terraced areas*, and* terraced slope.**

Documents	Keywords				
	terrace	*terraces*	*terraced landscape*	*terraced areas*	*terraced slopes*
OPN ŽIROVNICA (2011)	0	2	0	0	0
OPN TOLMIN (2012)	0	2	0	0	0
OPN TREBNJE (2013)	0	1	0	0	0
OPN VELIKE LAŠČE (2013)	0	1	0	1	2
OPN ŽELEZNIKI (2013)	0	2	0	0	0
OPN SEŽANA (2016)	0	1	0	0	0

ha of terraced land and 13,600 ha of land covered with grass), and maintaining the typical landscape and biodiversity (preservation of vineyards on steep terrain up to 3,500 hectares). Terraces are also mentioned in connection with growing olives; unfavorable land conditions challenge olive cultivation in Slovenia, and terraces aid adaptation to particular climate conditions (olive cultivation in Slovenia occurs in the most northerly regions where olives are cultivated, resulting in frequent frost). The land structure for olive cultivation, with terrace construction, creates high investment costs; however, the area planted with olives continues to increase. Olive groves on terraces are also recommended as a measure for dealing with overgrown areas.

An analytical review of the selected municipal documents (Table 4) shows that three keywords are never mentioned in the local municipal documents: *terrace*, *terraced landscape*, and *terraced areas*. The phrase *terraced slope* is mentioned in only one local municipal document. In the document for the Municipality of Tolmin, these phrases do not occur at all; nothing is mentioned connected with terraced landscapes. In the other documents, the noun *terraces* is mentioned once (in two cases), twice (in two cases), or three times (in one case).

The Waters Act (ZV, 2002), the Promotion of Balanced Regional Development Act (ZSRR-2, 2011), and the 2012–2016 Slovenian Tourism Development Strategy (SRST, 2012) do not involve the selected keywords (Table 5). In the Nature Conservation Act (ZON, 2004) and in the Environmental Protection Act (ZVO, 2006) the term *landscape* is used in the context of environmental impact assessment. In the Agricultural Land Act (ZKZ, 2011) the word *landscape* is mentioned among the general provisions: "The objectives of this Act are . . . the upkeep of the landscape." Article 6 of the Construction Act (ZGO, 2004) defines that maintenance of the facility could be carried out without a building permit if

***Table 5: National documents scanned for the terms* landscape*,* landscapes*,* landscape *(adj.),* cultural landscape*, and* agricultural landscape.**

Documents	Keywords				
	landscape	*landscapes*	*landscape (adj.)*	*cultural landscape*	*agricultural landscape*
ZV (2002)	0	0	0	0	0
ZGO (2004)	1	0	40	0	0
ZON (2004)	2	0	0	0	0
SPRS (2004)	83	11	63	31	5
ZVO (2006)	2	0	0	0	0
ZKZ (2011)	1	0	0	0	0
ZSRR-2 (2011)	0	0	0	0	0
ReSURSKŽ (2011)	0	0	0	8	0
SRST (2012)	0	0	0	0	0
SURSKŽ (2014)	7	1	5	25	1

the object has such shortcomings that they have a very poor effect on the external appearance of the landscape. The municipality can commit the owner to carry out required maintenance work, which should not be dangerous construction, in order to protect public interests. The Resolution on the Strategic Orientations of Development of the Slovenian Agriculture and Food Industry in 2020, "Zagotovimo.si Food for Tomorrow" (ReSURSKŽ, 2011) refers to the term *cultural landscape* in eight different contexts. It states that agriculture has an important impact on the cultural landscape and its aesthetic and natural values. Protecting the typical cultural landscape is a clear reason for defining a new agricultural policy. Economic development in rural areas is an important factor that contributes to strengthening the cultural landscape. The vision of agriculture also encompasses the cultural landscape, which is well organized. The concept of sustainable agricultural development with defined strategic objectives will be implemented by attaining the priority program guidelines in particular, one of which is the preservation of cultural landscapes. Strengthening the preservation of the cultural landscape is mentioned twice: among the principles and mechanisms of action and among the application and implementation of the resolution. The resolution's operational objectives define, among others, the preservation of typical cultural landscape elements. The Strategic Plan on Implementing the Resolution on the Strategic Guidelines for Agricultural and Food Industry Development by 2020 (SURSKŽ, 2014) focuses on and draws attention to the landscape diversity of Slovenia, to the orderly cultural landscape and special features of the cultural landscape, to the distinctive image and identity of the cultural landscape (i.e., vineyards and olive groves), and to the preservation and maintenance of the cultural landscape. Slovenia's Spatial Development Strategy (SPRS, 2004) is the ordinance that most defines the term *landscape* among all government documents. This is not a surprise, because Slovenian territory is well-known in terms of cultural and symbolic landscape significance. A reform of the Spatial Development Strategy of Slovenia will be prepared and the new strategic document will be adopted by the end of 2017. SPRS defines different types of landscapes, such as the outstanding cultural landscape, and states the development of the landscape (also as a cultural landscape and as an [intensive] agricultural production landscape). Traditional agricultural areas should continue to develop as cultural landscapes. The strategy defines the landscapes of national importance by pointing out 68 landscape areas, comprising areas where a terraced landscape is dominant (although the strategy does not state this) and have a high experience value, mainly due to geometrized terraced landscape.

An analytical review of the selected municipal documents (Table 6) shows that the keywords *landscape, landscapes, landscape (adj.), cultural landscape, and agricultural landscape* are always used in the local municipal documents (except the plural of the noun *landscape*). The term agricultural landscape is rarely mentioned in the documents scanned. In OPN Sežana (2013) cultural landscape is often written in the context of the outstanding landscape of Lipica. OPN Trebnje (2013) describes similar references to the cultural landscape such as those defined in national documents: to preserve the quality and identity of the landscape, to identify values and landscape diversity. OPN Velike Lašče (2013) adds to these observations the untapped touristic and recreational potential of the cultural landscape and an important mix of built structures and landscape. The Velika Slavica pilot area is specifically mentioned as a varied and very attractive cultural landscape: it combines extensive orchards, fields, gardens, and meadows on the terraced area below the village. OPN Železniki (2013) implements the specific interventions in the landscape in more detail and also mentions the archaeological landscape. The Smoleva pilot area is listed in a group of areas that are primarily characterized by settlement pattern. Areas of outstanding landscapes are highlighted in the OPN Sežana (2016). In its document the karst cultural landscape is defined by the typical landscape patterns and interweaving of the landscape with the settlements. In Žirovnica the intervention of transport infrastructure

***Table 6: Local municipal documents scanned for the terms* landscape, landscapes, landscape (adj.), cultural landscape, agricultural landscape.**

Documents	Keywords				
	landscape	*landscapes*	*landscape (adj.)*	*cultural landscape*	*agricultural landscape*
OPN ŽIROVNICA (2011)	23	0	17	9	4
OPN TOLMIN (2012)	78	7	54	13	1
OPN TREBNJE (2013)	4	0	9	9	1
OPN VELIKE LAŠČE (2013)	13	0	10	5	1
OPN ŽELEZNIKI (2013)	30	0	18	16	1
OPN SEŽANA (2016)	70	6	63	16	2

has to be carried out in such a way as to maintain landscape elements. The landscape structure should also be maintained. In Tolmin it is possible to find specific landscape patterns, such as alpine pastures. The landscape has also ecological significance. OPN Tolmin (2012) is prepared very precisely and also provides landscape units on the territory of the municipality. The landscape of the Rut pilot area received a national recognition in

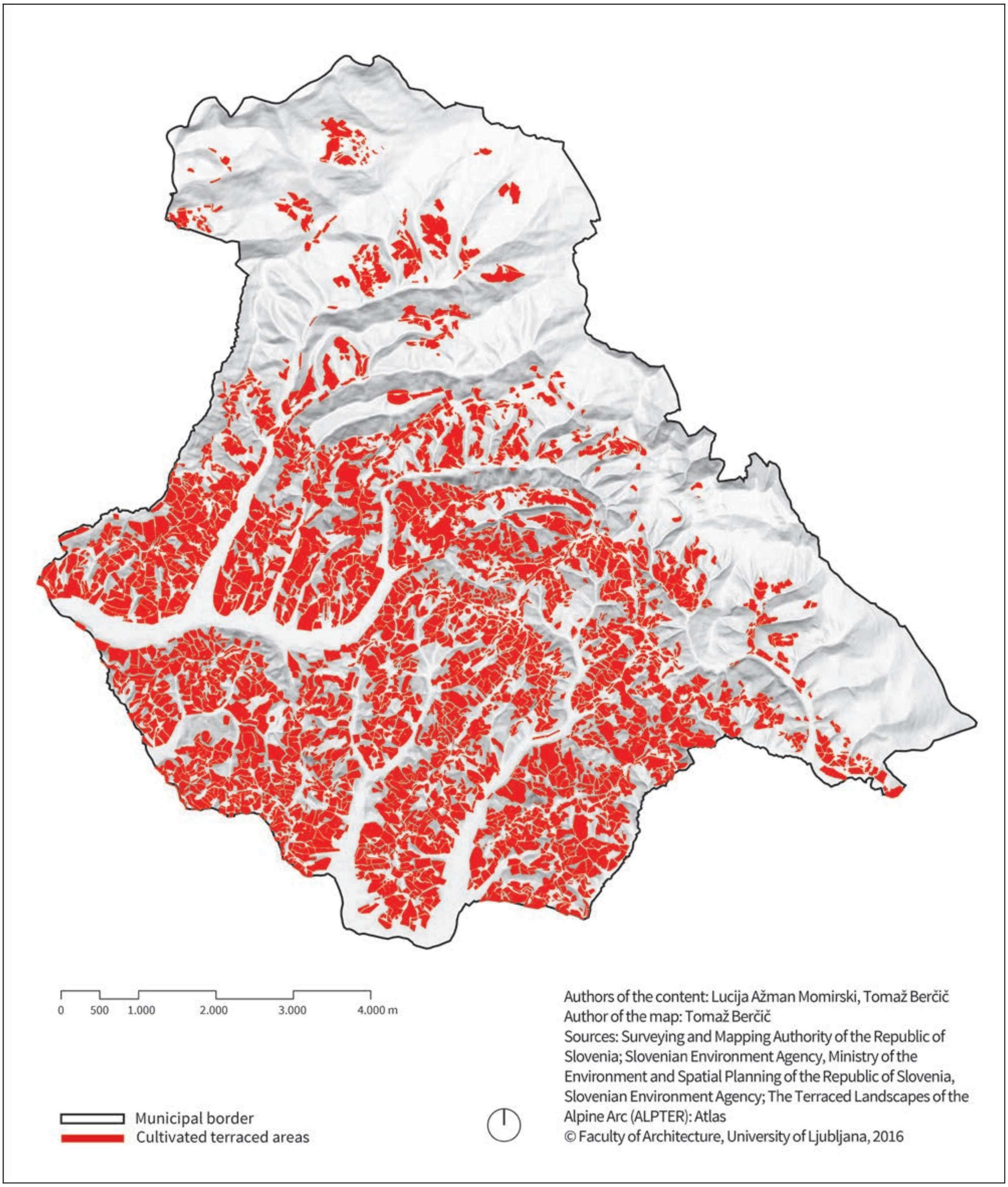


Figure 2: Updated plan of terraced landscapes (The Municipality of Brda).

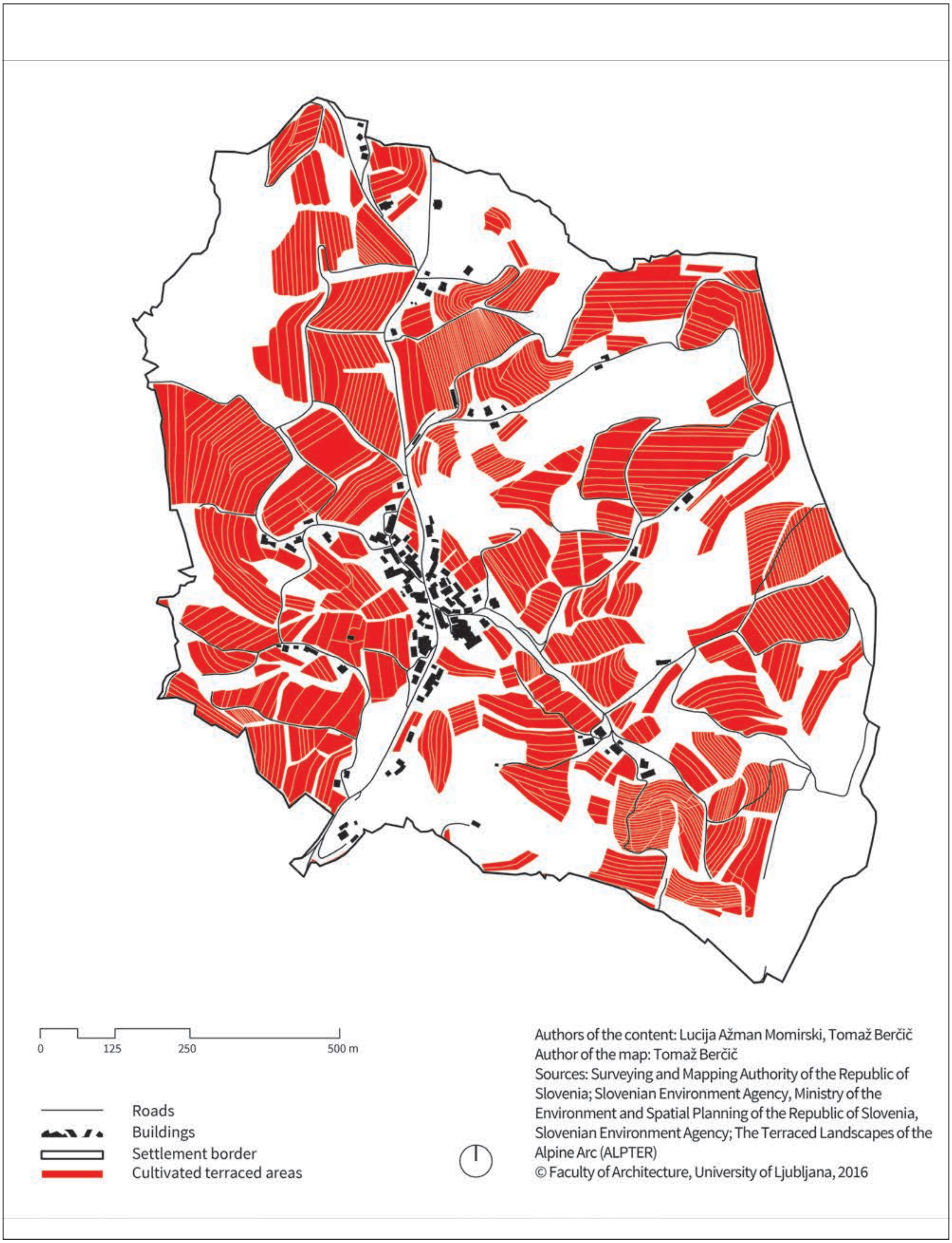


Figure 3: Updated terraced landscape plan in the settlement Medana (Municipality of Brda).

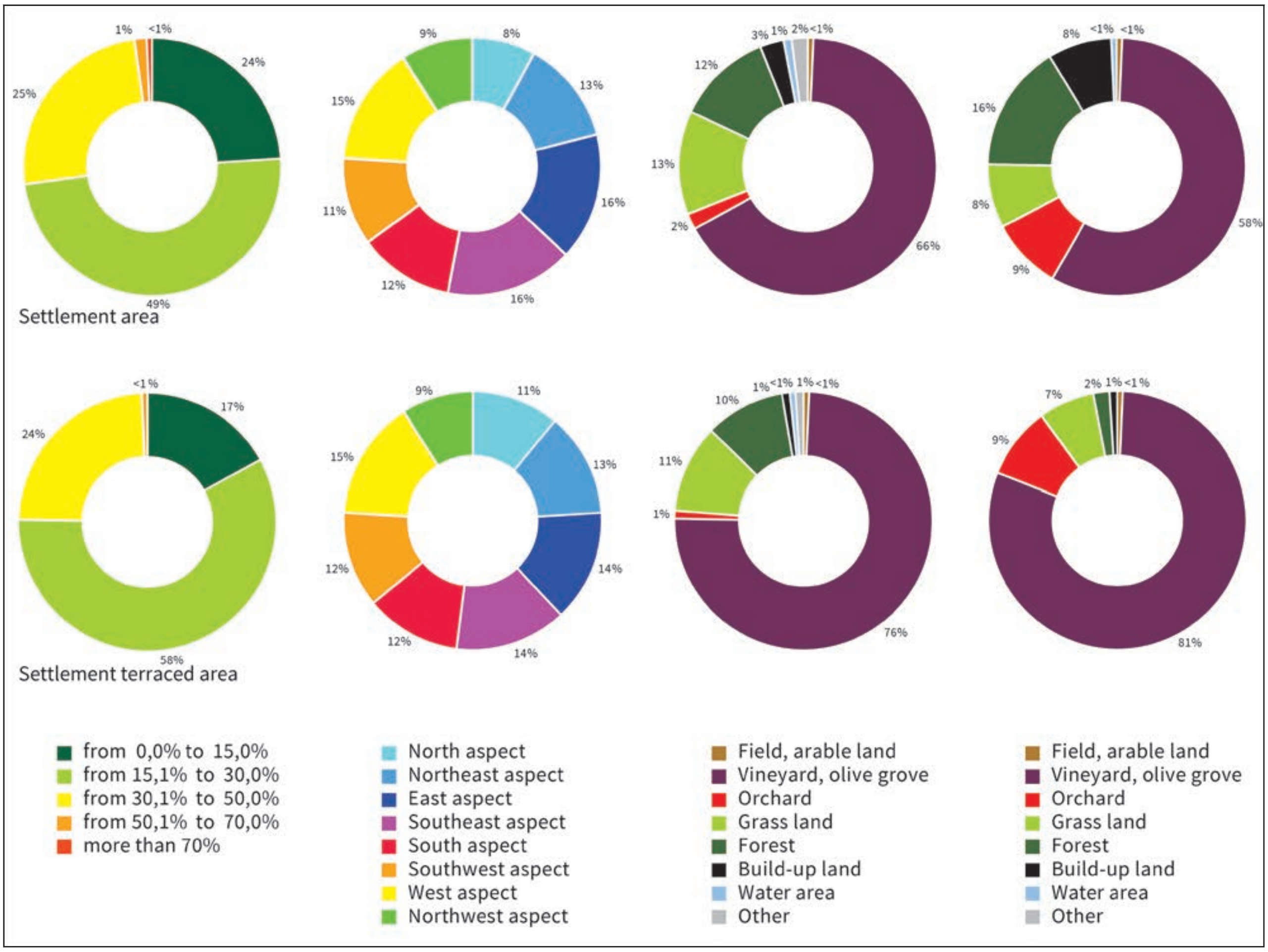


Figure 4: Data on terrain slope, terrain aspect, and land use according to the Franciscan Cadaster (1812) and contemporary land use in the cadastral unit of Medana. Sources: Surveying and Mapping Authority of the Republic of Slovenia, Trieste State Archives, Ministry of Agriculture and the Environment of the Republic of Slovenia.

SPRS, but a greater focus on protecting the village as protecting surrounding landscape is applied in the municipal document.

DISCUSSION

Selected documents can be divided into spatial and sectorial texts. Sectorial legislation covers only a small portion of landscape topics, but it does contain the essential part about terraced landscapes. On the other hand, the Spatial Development Strategy of Slovenia (OdSPRS, 2004) provides suitable, but very general guidelines, which are often vague and with no requirements of how to deal with landscape at the local level. Terraced landscapes are hidden within the term *cultural landscape* and are undeniably considered as part of the cultural landscape; certain statements also apply to terraced regions. In addition, parts of the strategy are obsolete due to changes in data, new strategic global and European orientations, and so on.



Figure 5: Updated terraced landscape land-use plan in the settlement Kožbana (Municipality of Brda).

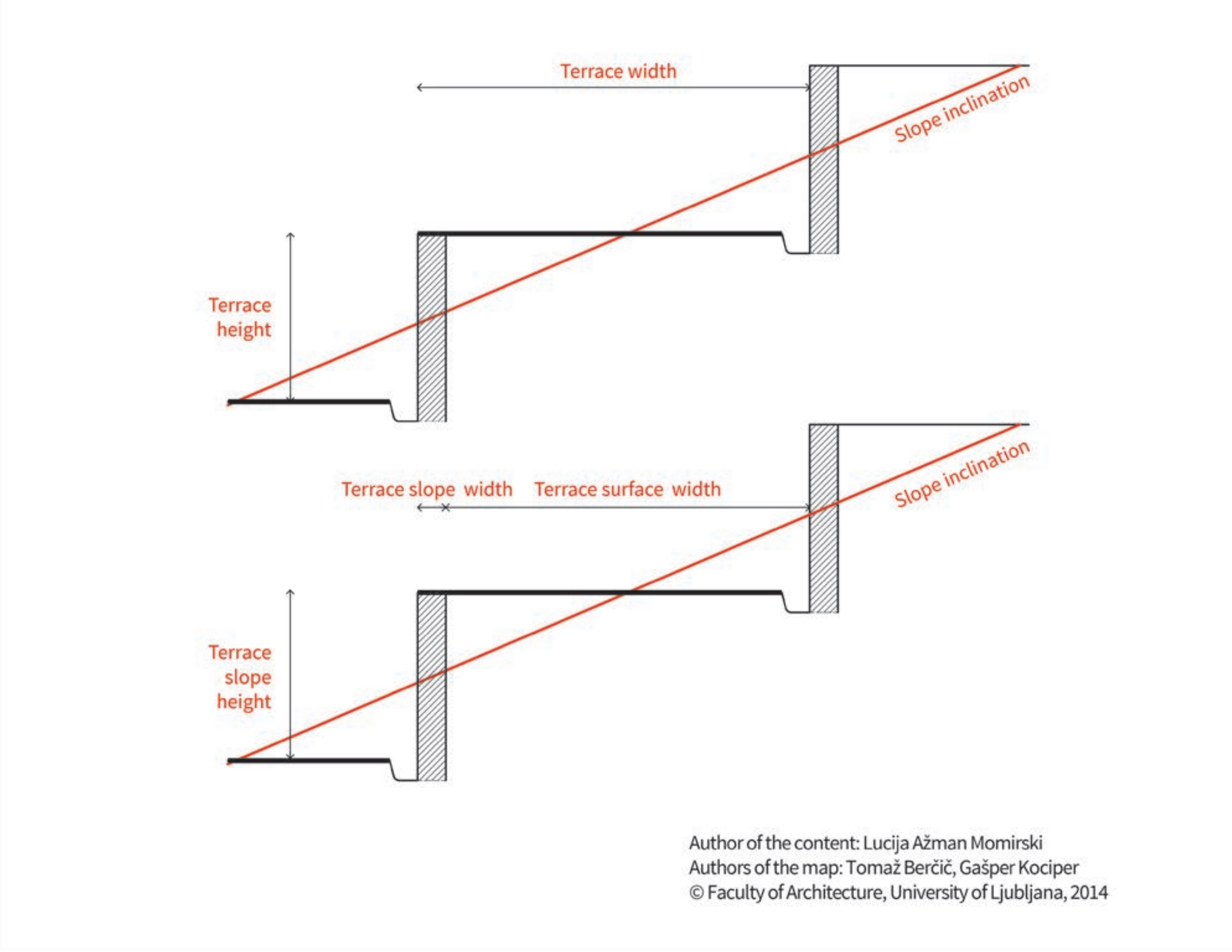


Figure 6: Cross-section of individual terrace in the Koper Hills.

Planners at the municipal level usually rely only on general descriptions of national documents and they do not develop their own identifications of landscape features, particularly describing the state of the area. This means that the assessment of the landscape rarely goes into details of the typical landscape elements. But when the description of the current situation is done, the assessment is lacking, meaning that in OPNs there is a very different way to treat landscape. The extent and quality of the landscape treatment in OPNs depends on the planner's expertise. Elaboration of the professional guidelines is at the mercy of local municipalities, which usually follow the rule: that which is not required is often not implemented.

National documents mainly specify general guidelines, so it is necessary to emphasize that more accurate data are needed at the operational level in order to define landscape diversity and other landscape issues. Some of the data (e.g., exceptional landscape elements) have not been formally acknowledged in the professional community, and this represents an obstacle in addressing cultural landscapes. Similarly, the fact that terraced landscapes are built, constructed landscapes (Ažman Momirski et al., 2007; Ažman Momirski, Kladnik, 2008, 2009, 2015) and that precise rules and methods for their construction exist today, has not been made evident. No national or municipal document mentions the search phrase *terraced landscape*. Moreover, the richness and multiple intertwined layers of terraced regions can only be comprehended through an interdisciplinary approach in research and professional elaboration.

Surprisingly, global and international trends and Slovenian research have not induced Slovenian documents to involve themes specific to terraced landscapes. We are convinced that Slovenian terraced landscapes have too many meaningful values to remain ignored, so we propose a procedure that would enable institutions at the national and local levels to acknowledge their importance.

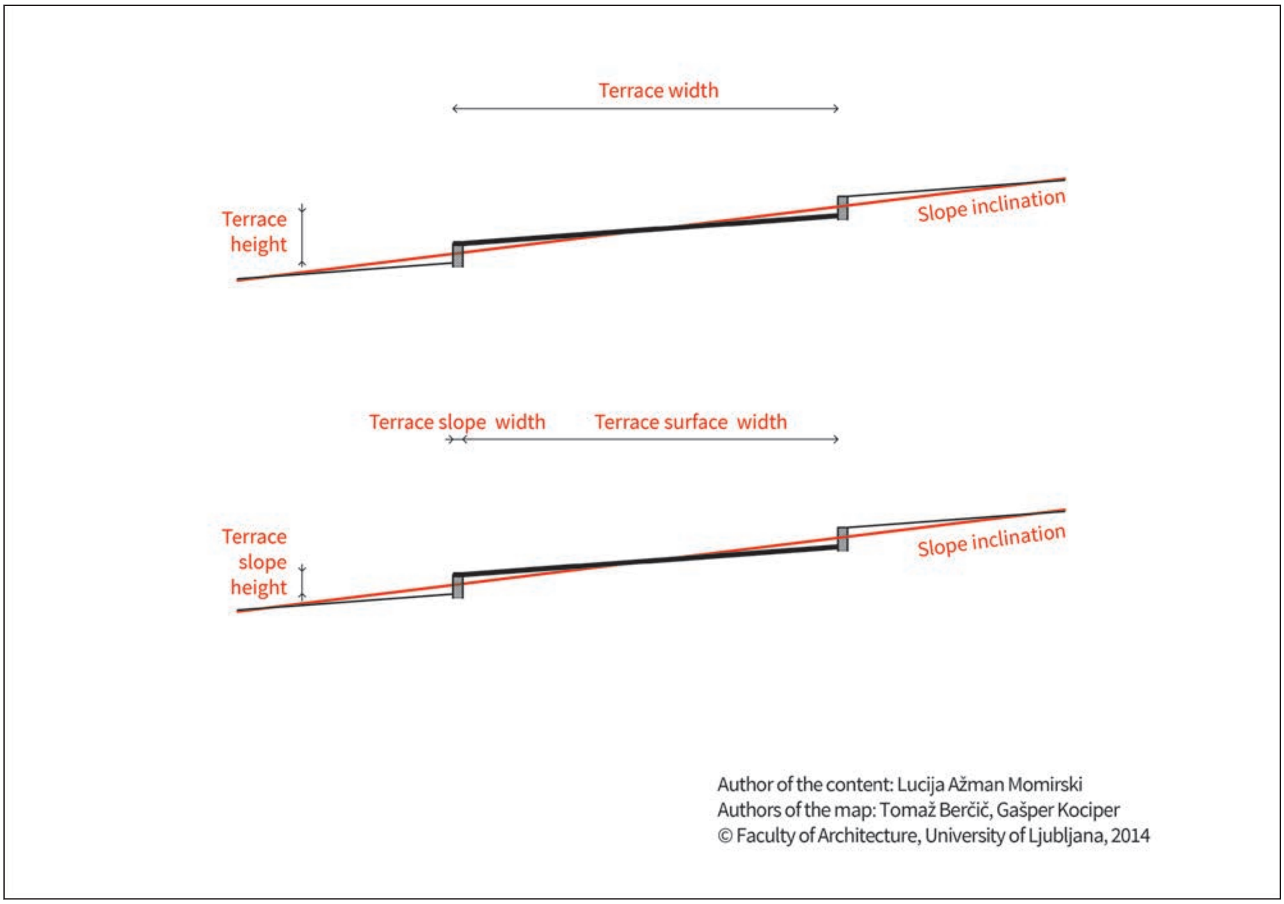


Figure 7: Cross-section of individual terrace in the Karst cultural landscape.

One step towards building greater awareness of terraced landscapes is an elaboration of the inventory of the terraced areas following the methodology of different territorial levels. At the level of the entire municipality, which is the first level, is important to recognize all terraced area. With the use of modern planning methods additional data layers, such as orientation, slope, land use, and other details useful for further evaluation, could be investigated. The most useful conclusions at this level are the extent of the area (ha) and comparisons with other data gathered in the process of elaborating spatial, strategic, and implementing acts. If an inventory of a given terraced landscape has already been made, updated plans can show the increase or decrease of the phenomenon (Figure 2).

The second level covers the cadastral unit or settlement. Here the inventory should be more detailed, showing not only terraced areas, but also single terraces that contribute to the terraced landscape. Similar to the previous level, the most useful information is the extent of the area (ha), which can be updated to show the increase or decrease of the phenomenon (Figure 3). In the case of dry walls, vineyards, and orchards, the lengths of the terraced slopes are measured because of the dry wall reconstruction and for the calculation of grapevines or fruit trees. Additional data such as orientation, slope, land use, and so on are also useful (Figure 4, Figure 5). It is reasonable to prepare various cross-sections of individual terraces of the area because the typology of terraced slopes and terraced platforms can change even within the same settlement (Figure 6, Figure 7, and Figure 8).

Finally, we highlighted features of terraced systems for a single plot. Two additional documents influence the elaboration of the plans at this level. Regulation on the types of buildings depending on their complexity (complex, less complex, and simple structures; Uredba, 2013) determines that terraces can be built without a building permit, if their height does not exceed 1.5 m. The Agricultural Land Act (ZKZ, 2011), which ranks terrace construction among major land-improvement measures, requires investors to prepare a plan for this land-improvement measure. Data important for the assessment of a plot plan include the area of the terrace platform, the plan (projection) area of the terraced slopes, and the area of the paths. More important than the height of the terraces is the height of the terrace

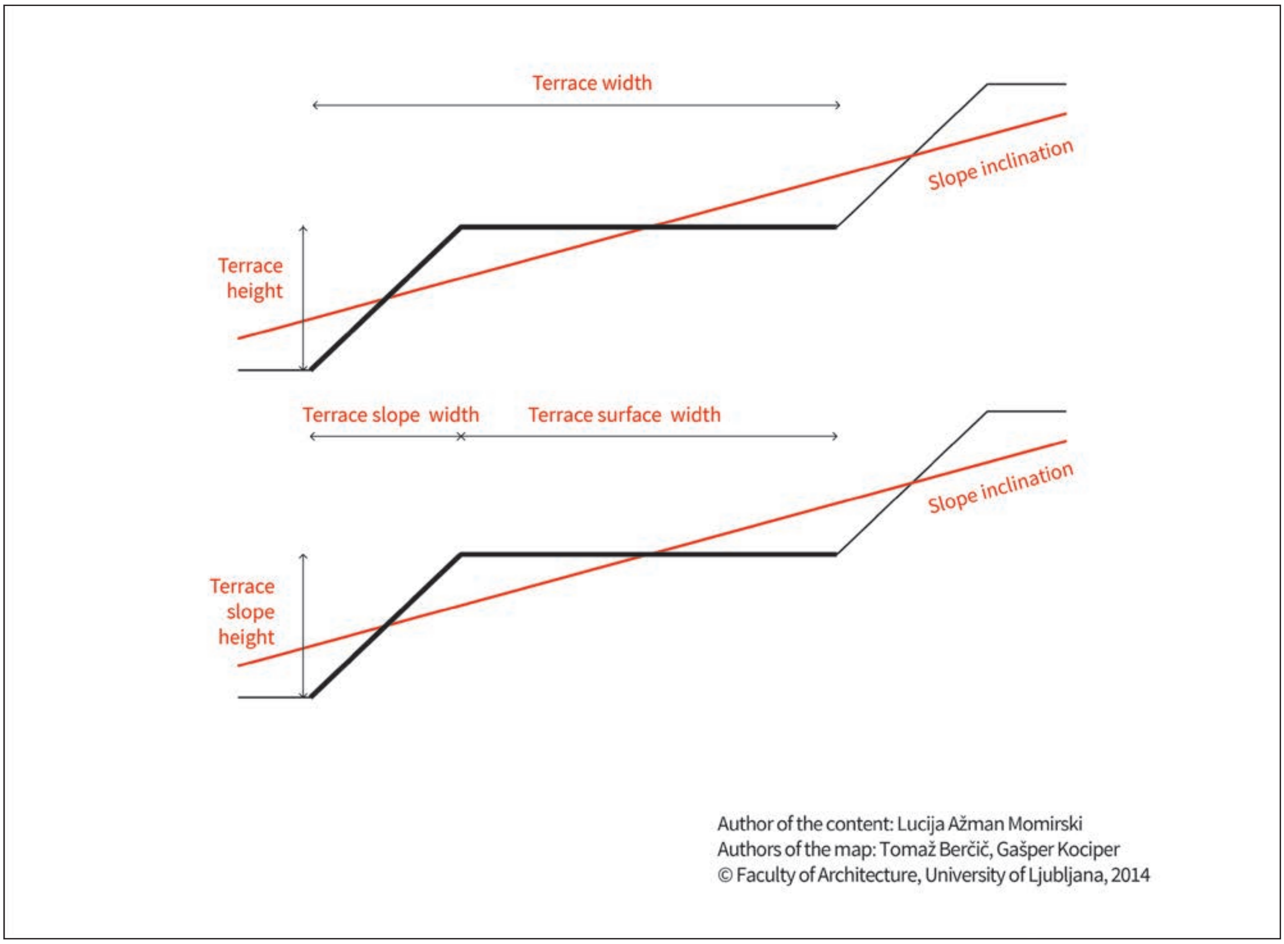


Figure 8: Cross-section of individual terrace in the Brkini Hills.

slope: combining it with the length of the terrace platform, it is easy to calculate the costs for the dry wall reconstruction. Again, in the case of dry walls, vineyards, and orchards the length of the terraced slopes is measured because of the calculation of dry wall reconstruction and for the calculation of grapevines or fruit trees (Figure 9).

CONCLUSION

It is important to record and understand terraced landscapes. If its real characteristics are clearly known, it will be easier to add values and a future to this land. However, Slovenian spatial planning has not recognized terraced regions as a landscape system *sui generis*. Therefore, terraced landscapes cannot be called a landscape of abandonment (Varotto, 2014), but better a landscape of ignorance. Following the European landscape conventions, this study appeals to national and local public authorities to adopt policies and measures at the local, regional, national, and international levels for protecting, managing, and planning terraced landscapes. In some regions in Slovenia terraced landscapes are increasing: an updated plan of terraced landscapes in Goriška Brda shows that the terraced area has grown in the last ten years by almost 100 ha. This finding alone is enough reason to encourage a more in-depth engagement with terraced regions.

Implementation at various levels of terraced landscape should be based on cross-sectorial and cross-academics collaboration, which is hardly easy, although it is necessary and desirable. Collaboration means linking and sharing information, resources and activities to achieve jointly an outcome. Implementation also demands a shift or additional push from the administrative legalities to establishing capacities for physical practicalities. A detailed review of the renewal of vineyards reveals that a major impact on arrangement of terraced vineyards had government incentives, i.e. subsidies for such works. Implementation of the described methodology could be achieved also by establishing and implementing a wider interdisciplinary set of policies and actions through Rural Development Programme. Applying bottom-up approach, in which base elements (terraces)

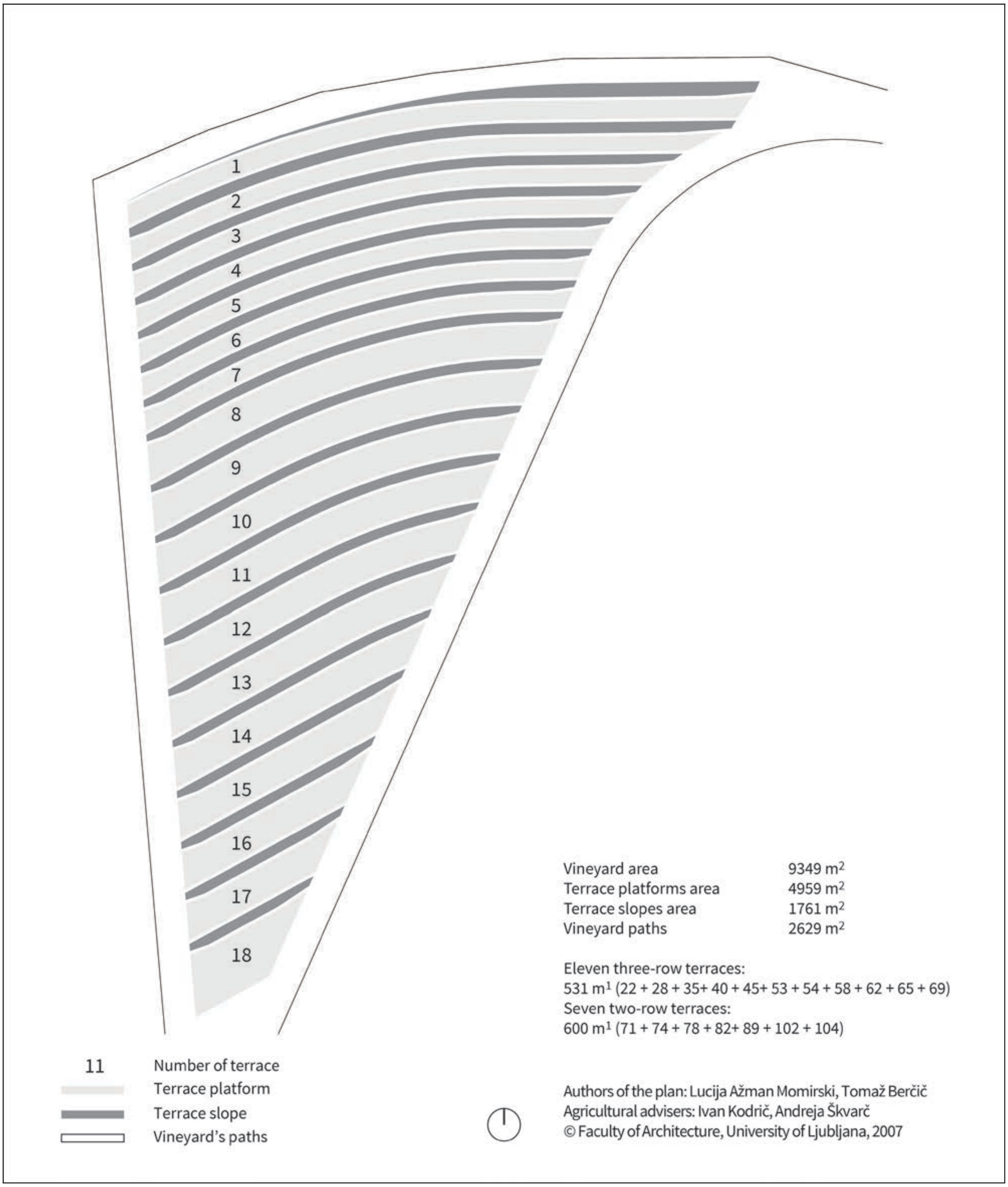


Figure 9: Scheme of the terraced plot in Medana (Municipality of Brda).



Figure 10: Terraced landscape in Višnjevik (The Municipality of Brda).

are specified in detail and then linked together, forming in steps larger systems (terraced landscapes), would be precise and useful. On the opposite, the approach which starts with big picture, as is the case today, will fail as it is not detailed enough to realistically validate terraced areas.

PREZRTA OBMOČJA: SLOVENSKE TERASIRANE POKRAJINE

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POVZETEK

Prispevek v uvodu predstavlja pregled raziskovalnih projektov terasirane pokrajine na svetovni, evropski in slovenski ravni. Objavljene študije naraščajo v svetu, v evropskem in državnem akademskem prostoru. Različne civilne iniciative si prizadevajo za prepoznavanje, zaščito in ohranitev terasirane pokrajine. Na seznam svetovne kulturne dediščine je uvrščenih nekaj izjemnih terasiranih krajin. V sodobnosti so bili oblikovani pomembni dokumenti, kot sta Honghe deklaracija za terasirano pokrajino in Evropska krajinska konvencija za kulturno krajino. V raziskavi smo ugotovili, da tako na državni in lokalni ravni v dokumentih ni uporabljenega pojma terasirana pokrajina, v nacionalnih dokumentih pa tudi nismo našli pojmov terasa in terasirano pobočje. Ugotovitev je presenetljiva, saj lahko terasirano pokrajino zaznamo kar v stotriindevetdesetih občinah v Sloveniji. Svetovni in mednarodni trendi, pa tudi opravljene slovenske raziskave niso vplivale na slovenske strateške, zakonodajne in prostorske dokumente, da bi slednji v svoje tekste vključili specifične pojme povezane s terasirano pokrajino. Ker smo prepričani, da so terasirane pokrajine pomembna prostorska prvina, ki ima posebne lastnosti, predlagamo postopek, ki ga lahko državne in lokalne ustanove uporabijo, ko se soočajo s pojavom terasirane pokrajine. Izvajanje postopka mora temeljiti na medsektorskem sodelovanju in uporabi pristopa od spodaj navzgor.

Ključne besede: terasirana pokrajina, državni strateški dokumenti, prostorsko načrtovanje, občinski prostorski načrt, Slovenija

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PHYSICAL AND SOCIAL ASPECTS OF LAND DEGRADATION IN MEDITERRANEAN HIGHLAND TERRACES: A GEODIVERSITY APPROACH

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ABSTRACT

The aim of the present research was to investigate the mechanisms leading to the erosion and destruction of terraces under Mediterranean climatic conditions, with special focus on the bulge of the terrace retaining wall. The main research area were abandoned terraces in the Western Galilee in Israel. Experimental plots to measure runoff and sediment yield were installed in the abandoned and cultivated terraces. Runoff coefficients for most plots were less than 1% and highest sediment yield was 8.3 g/m^2 for one plot. Runoff and sediment yield were high in the steep slopes sites and low in the low gradient terraces.

Keywords: agricultural terraces, land degradation, geodiversity, soil erosion, mediterranean- type climate

ASPETTI FISICI E SOCIALI DEL DEGRADO DEL SUOLO NELLE TERRAZZE SUGLI ALTIPIANI MEDITERRANEI: UN APPROCCIO BASATO SUL CONCETTO DI GEODIVERSITÀ

RIASSUNTO

Lo scopo della presente ricerca è stato quello di studiare i meccanismi che conducono all'erosione e alla distruzione delle terrazze a causa delle condizioni climatiche Mediterranee, con una focalizzazione particolare sulla protrusione del muro di contenimento della terrazza. L'area principale dello studio ha riguardato le terrazze abbandonate della Galilea Occidentale in Israele. Sono stati istallati lotti sperimentali per misurare il deflusso e la produzione di sedimento nelle terrazze abbandonate e coltivate. I coefficienti di deflusso per la maggior parte dei lotti sono stati inferiori all'1% e la produzione più elevata di sedimento è stata di 8,3 g/m² per un lotto. Il deflusso e la produzione di sedimenti sono stati elevati nei siti dei pendii ripidi e bassi nelle terrazze a scarsa pendenza.

Parole chiave: terrazze agricole, degradazione del terreno, geodiversità, erosione del suolo, clima di tipo mediterraneo

INTRODUCTION

This research addresses the problem of changing human activities in the fragile environment of the historical agricultural terraces in the Mediterranean highlands. The high degree of connectedness of this coupling is a major threat to one of the oldest achievements of Man in the development of the Earth's natural resources. Over more than a millennium soil accumulated in the man-made terraces being the economic basis for a flourishing culture and an increasing landscape geodiversity. Old developed systems of agricultural terraces are found in high relief settled areas in different parts of the world (Inbar, Llerena, 2000).

Building of terraces achieved five purposes:

1. Developing a flat area in the mountain area for cultivation.
2. Accumulation of soil in steep shallow soil slopes.
3. Increasing the soil water storage, and in irrigated areas to allow efficient use of water.
4. Reducing soil erosion (farmers probably did not mean this achievement).
5. Creating a microclimate, increasing sun radiation and decreasing frost events.

The abandonment of the terraces leads to an increased rate of soil erosion and sediment yield values. From the socioeconomic point of view, land degradation determines social changes in the rural communities and is one of the factors in the migration process of the young rural population to the overcrowded urban areas.

The abandoned terraced areas were afforested mainly by pine plantations, increasing the recurrence of forest fires. A huge forest fire burned thousands of hectares of pine trees in the Carmel mountain in 2010 and old terraces from different historical periods were discovered.

A comprehensive review on agricultural terraces in the Mediterranean region was recently published by Arnaez et al. (2015).

Biodiversity is considered by the scientific community a major goal for Man, but few projects emphasize the geodiversity problem. The abiotic world of mountains and rock is seen as stable, static and much too prolific ever to be endangered (Gray, 2004). In natural systems, Man's activities may degrade Geodiversity and their impact will depend on the stability of the geomorphic system. In Biodiversity the extinction of biological species is irreversible, but also the extinction of geomorphic landforms like glaciers or wetlands are irreversible processes. Thirty years ago there was no major interest in "biodiversity" and "sustainability" of ecosystems. There is a need to increase geoconservation principles and goals (Gordon, Leys, 2001). In recent years there is a growing concern on the issue among geomorphologists and in the last *International Association of Geomorphologists Congress* in 2013 in Paris a working group on landform assessment for Geodiversity was established (IAG Newsletter, 2016).

Agricultural mountain terraces are a positive anthropic impact on the natural landscape and the aban-

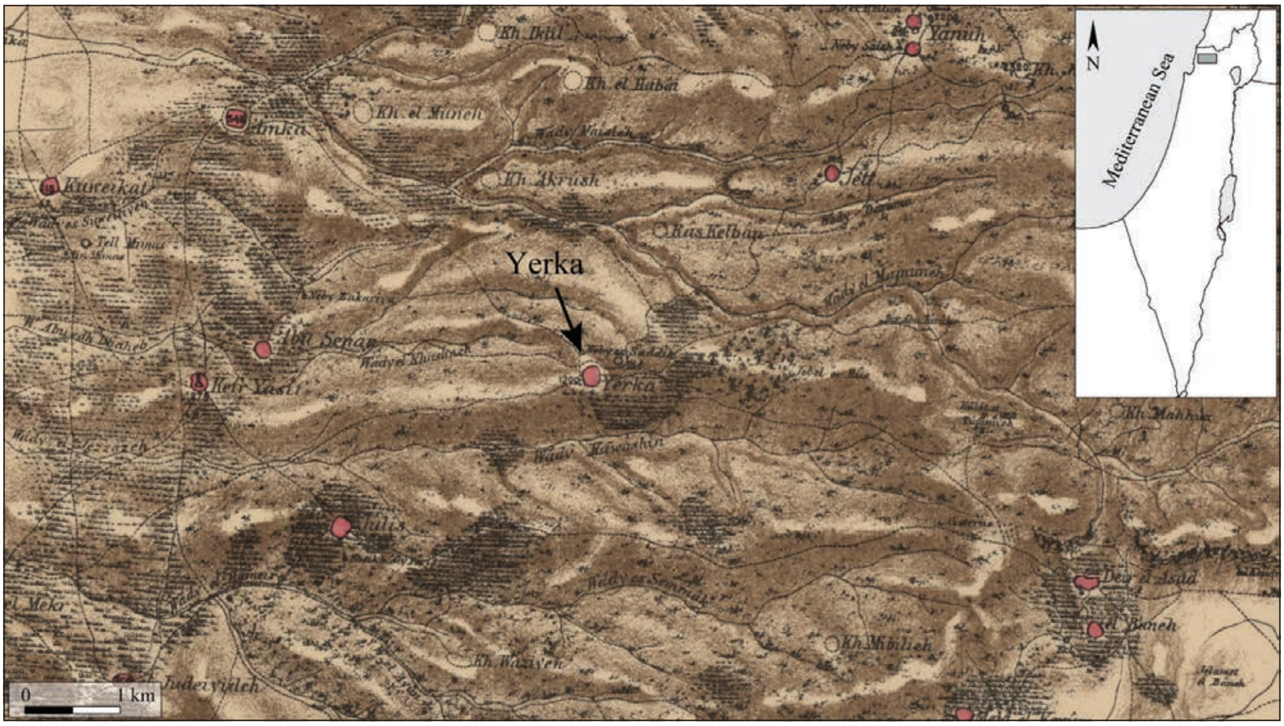


Figure 1: Location map. PEF (Palestine Exploration Fund, 1870) map shows signs of terraces near the Yirca village.



Fig. 2: View of the study site: Western Galilee.

donment process increases the environmental degradation. Man's activities changed for centuries most of the landscape, and fragile environments like the Mediterranean, are losing the agricultural terraced landscape, probably the most important land cultural heritage from early stages of human history.

Mediterranean areas are characterized by three common principles: climate, relief and human impact history. The climatic boundaries are 900 mm for the upper humid areas, 275 mm for cool coastal stations and 350 mm for warm interior stations; 65% of rainfall should be concentrated in the winter half year. The coldest month in winter has an average temperature below 15 °*C* and temperatures below 0 °*C* do not exceed 3 % of the total year hours (Inbar, 1998).

Land degradation, in its broad meaning, is "the deterioration of physical and chemical properties of the soil and inland waters that occur as a result of environmental change and which result in soil erosion, problems of sedimentation and flooding, the loss of fertility and sometimes in salinization" (Conacher, 1998). The degradation process includes visible forms, like erosion or deforestation. Other forms are less visible, such as salinization and water contamination.

Soil erosion, land degradation and desertification are processes that affect most of Mediterranean landscapes, and may be related to social and environmental degradation leading to overpopulated cities, famine, and concern about the needs for future generations.

Mediterranean landforms merit thorough enquiry. They are among the most vulnerable and fragile environments on Earth.

Considering the Mediterranean-type climate region as an unstable earth surface system, the most important implication for the human- environment relationship is that managers, planners and land users have to be aware of the inherent instability of the system. Human interference in the environment exacerbates the negative natural biophysical processes, and the results are more frequent and more severe geomorphic processes like floods, landslides, soil erosion, etc.

Mountain semiarid habitats are most common in the Mediterranean regions, and their ecosystems are characterized by intensive erosive processes. Agricultural land use is a major factor affecting erosion processes, and in mountainous areas the conservation or abandonment of terraces is a crucial factor in soil loss. For over more than two millennia soil accumulated in the human



Fig. 3: Modern terraces built by machine in the lower valley.

made terraces, which were the economic basis for flourishing cultures. In the Eastern Mediterranean countries terrace construction began at ancient periods, at least since the fifteenth century BC. In the Iberian countries early terraces are probably from the Roman period. Other researchers suggest older ages and speculate that terracing developed earlier than 5000 years B.P. (Gibson et al., 1991). Old terraces were dated to three main periods—late Bizantine, Medieval and Ottoman—by OSL methods in the Jerusalem area (Davidovich et al, 2012).

Abandonment of agricultural land is widespread in the mountainous area of the Mediterranean countries of Europe. Erosion processes increased due to the abandonment of terrace fields, as in the Western Mediterranean countries and in old land terrace systems in Israel and Jordan.

The aims of this study were to find what are the degradational processes after abandonment of terraces due to changing human activities in the fragile mountain environments of a typical Mediterranean landscape in the Lower Galilee in Northern Israel.

STUDY AREA

The study was carried out on agricultural terraces near the Yirca village in the Western Galilee, Israel (Figure 1). Average annual precipitation is 710 mm. Rainy season begins in October and ends in April, and the rainiest months are December, January and February. Mean annual temperature is 20 °C.

Terra rossa and rendzina are the soil types. The terra rossa falls within the range of the inorganic clays of high plasticity, whereas the rendzina falls within the range of the inorganic clays of medium plasticity, on the chart of the Unified Soil Classification System. Soils are shallow and depths vary from a few centimeters to 50-80 centimeters, and their occurrence is usually on pockets. In the terraces soil accumulation depends on the height of the retaining wall. Most of terraces are abandoned and on some of them olive trees are cultivated. In the fifties tobacco plants, cereals and legumes were cultivated on the terraces (Figure 2 and 3). In the Judean hills, forested areas by the national forestry institution—the Keren Kayemet Leisrael—were formerly terraced. After forest fires, the recommendation by forestry and soil experts is to rehabilitate the old terraces and plant on them native trees species like oaks, that are more resilient to fire than pines.

Terraces were formed and filled with local soil, and for centuries permanent maintenance provided the economic basis for flourishing cultures. Slope angles dropped from 100% to 10% or less. Manure, ash and



Fig. 4: Experimental plot #1: plastic fences are the limits of the plot.

human waste filled the terrace and contributed to its consolidation and development. Vegetation holds most of the soil and its removal by grazing is the main erosive agent.

METHODOLOGY AND RESULTS

The study program is based on field experiments:

1. Experimental plots

Five experimental plots were installed on abandoned terraces and one control plot on a cultivated terrace, in order to measure runoff and sediment yield from terraces after rainstorms

The plot area for each terrace is between 2 m^2 and 36 m^2. The plot is bordered by a plastic fence closed at a lower apex with a plastic tube delivering water and sediment through a pipe to closed containers (Figure 4). Rainfall was measured by rain gauge daily. Water and sediment are collected after each rain and the total amount or a sample is kept for sediment content and analysis at the laboratory.

The three experimental years were relatively dry and no major rainstorm was recorded. Runoff was negligible during most of rainstorms and few sediment samples were collected. The largest runoff event occurred after a 20 mm/day rainstorm. Runoff from abandoned level bench terraces with remaining retaining walls is very small (4.2 lit/m^2/year on the average). Sediment yield from such terraces is also very small (6.15 g/m^2/year on the average) (Table 1).

The large difference between the runoff values of the experimental plots may be explained by local factors, failure in collecting the runoff and infiltration processes. Sediment yield values are smaller on high runoff events, therefore the difference among parcels is less than in the runoff values.

The highest runoff coefficient for a single storm was 0.85 and sediment yield 309g for plot. Annual runoff coefficients for most plots were less than 1%.

Sediment yield values measured in the experimental plots were about 6 g/m^2/year or the equivalent to 6 ton/km^2/year which is considered a negligible rate o very low in comparison with world average rates of about 100 t/km^2/yr (Young, 1969). Only during high magni-

Table 1: Runoff and sediment yield in the experimental plots on abandoned terraces. Plot 1 is on a cultivated terrace.

Plot	Area (m2)	Average Runoff events per season	Runoff/Rainfall	Runoff (L/m2)	Sediment yield (g/m2)
1	5	2.75	0.14	1.1	16.0
2	36	3.5	0.07	0,51	0.26
3	15	4.35	0.26	2.03	3.83
4	22	8.5	0.46	2.88	8.32
5	10	4.33	2.33	18.6	7.41
6	2	3.3	0.04	0.13	1.07

tude rainstorms with very low frequency, probably with a return period of 1:50 years, large wall failures occur and erosion from the terraced slopes is considerable. On the terraced slopes there is no natural vegetation and being uncovered by vegetation high magnitude erosion processes may affect them during high magnitude catastrophic processes. In the cultivated terraces the rate of infiltration is high and there should be no erosion.

2. Rainfall simulation

A field portable rain simulator was used to measure runoff and infiltration rates on different physiographic conditions and terraces land uses. The equipment was adapted from a model used in Spain (Calvo et al., 1988) and it consists: 1) of two pressure pumps, giving a constant pressure of 1.7 Atmosphere, equivalent to a rain intensity of 40 mm/hour; 2) an aluminium structure holding the pipe to a spray nozzle jet at a height of 170 cm above ground; 3) a metallic ring 56 cm diameter fixed about five cm in the ground, limiting the draining ground area into a collecting tube and can. The simulator produces rainfall with a realistic drop size and it was applied until a constant rate of runoff was achieved, usually after one hour or if the infiltration rate was very high and no runoff occurred, the simulation was suspended after two hours. The rainfall amounts and intensities are considered to be high and of low frequency in this area. Water and sediment samples were collected every 3 to 5 minutes throughout each experiment. Samples were oven-dried (110 °C) and weighed and sediment yield was calculated.

All tests were carried out in the dry season in dry antecedent soil moisture conditions. In the cultivated and low gradient terraces infiltration was high. In high steep slopes runoff started after 15-20 minutes and rates of infiltration were 15-20 mm/hour. Runoff and sediment yield were high in the steep slope sites, and low in the cultivated and low gradient terraces.

Runoff generation on the rendzina soil is quicker than on terra rossa soil. The average time gap between the onset on rain and the beginning of runoff on dry rendzina as inferred from the results of the rain simulation experiments is 12 minutes, compared with 65 minutes for dry terra rossa. The average time gap between the onset of rain and stabilization of the infiltration rate is shorter for the rendzina soil—73 minutes—than for the terra rossa soil—155 minutes. The average final infiltration rate in rendzina is smaller than in terra rossa—2.32 cm/hour compared with 3.46 cm/hour on the average. According to the results of the rainfall simulation experiments, terra rossa soil is much more erodible than rendzina soil. The generation of saturated runoff

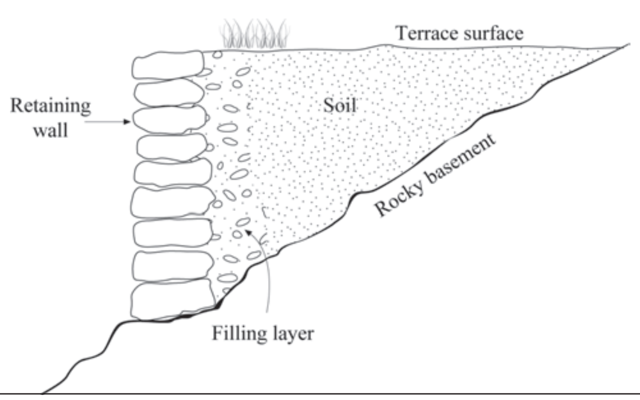


Figure 5: Terrace components.

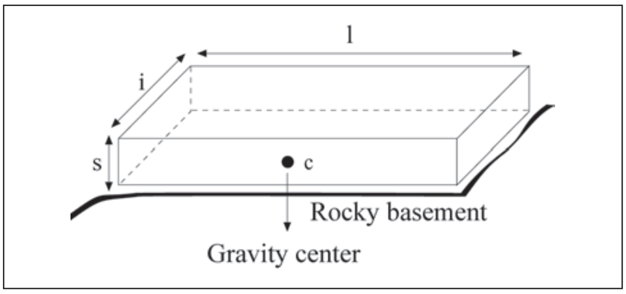


Figure 6: Retaining wall rock axis.

upon such terraces depends upon water content of the upper 30 cm soil layer at which extreme changes in water content occur during the rainfall season.

3. Terraces morphometry

A traditional agricultural terrace is made of three distinctive parts: 1) A built stone retaining wall. 2) An intermediate filling layer made of small stones. 3) A level of soil created by colluvial sedimentation behind the wall and the filter layer (Zgaier, 2009), (Figure 5). The building stones are angular and bladed, and their long axis is about 30 cm and the average weight 25 kg. Most terraces area is between 10 m^2 to 30 m^2. The average length is 10 m and width varies between 2 m and 5 m. The typical wall is one meter high and three meter long.

The height of the wall is proportional to the angle of slope, and it may vary from one meter or less for 10 % angle slopes, up to three meters or more for slopes above 45% values. No mortar was used in the wall building. The wall stones were collected from the terrace vicinity, as part of the work of cleaning stones from the slopes. There was no transport of soil from downslope valleys. The building of the wall requires knowledge and experience, and elongated and angular rocks increasing friction were preferred. Rocks axis were put perpendicular to the wall (Figure 6).

Physiographic and morphometric characteristics of the terraces were measured: length, width, area, stoniness and slope terrace; length, height, stone dimensions and curvature of terrace wall. Wall swelling and bulge development is characteristic to many retaining walls before their failure, and they develop due to the lateral soil pressure and its shearing effect. The wall collapse determines the starting of accelerated soil erosion from the terraces (Figure 7).



Figure 7: Collapsed wall.

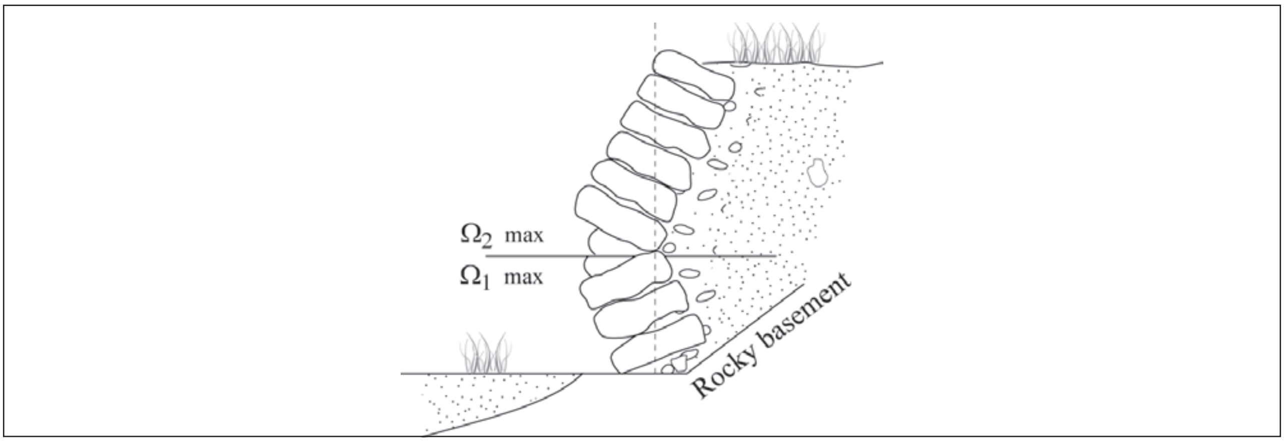


Figure 8: Wall bulge on the 1/3 lower section.

The terrace wall is the main factor determining the terrace stability or degradation. Saturated soils and its shearing effect determines pressure and swelling on the walls until failure occurs (Salas Pinto, Vasques Villanueva, 1987; Pallares Bou, 1994). The wall bulge appears at 1/3 height and divides the wall in two sections (Fig. 8). The angle Ω of a stable wall is about 85degrees. An unstable retaining wall was defined when at least one of its two segments had an actual base angle only slightly smaller than the maximum tilt angle of its base (Fig. 9). All wall failures checked in the field reached the critical value before the slide process. Figure 9 shows in a

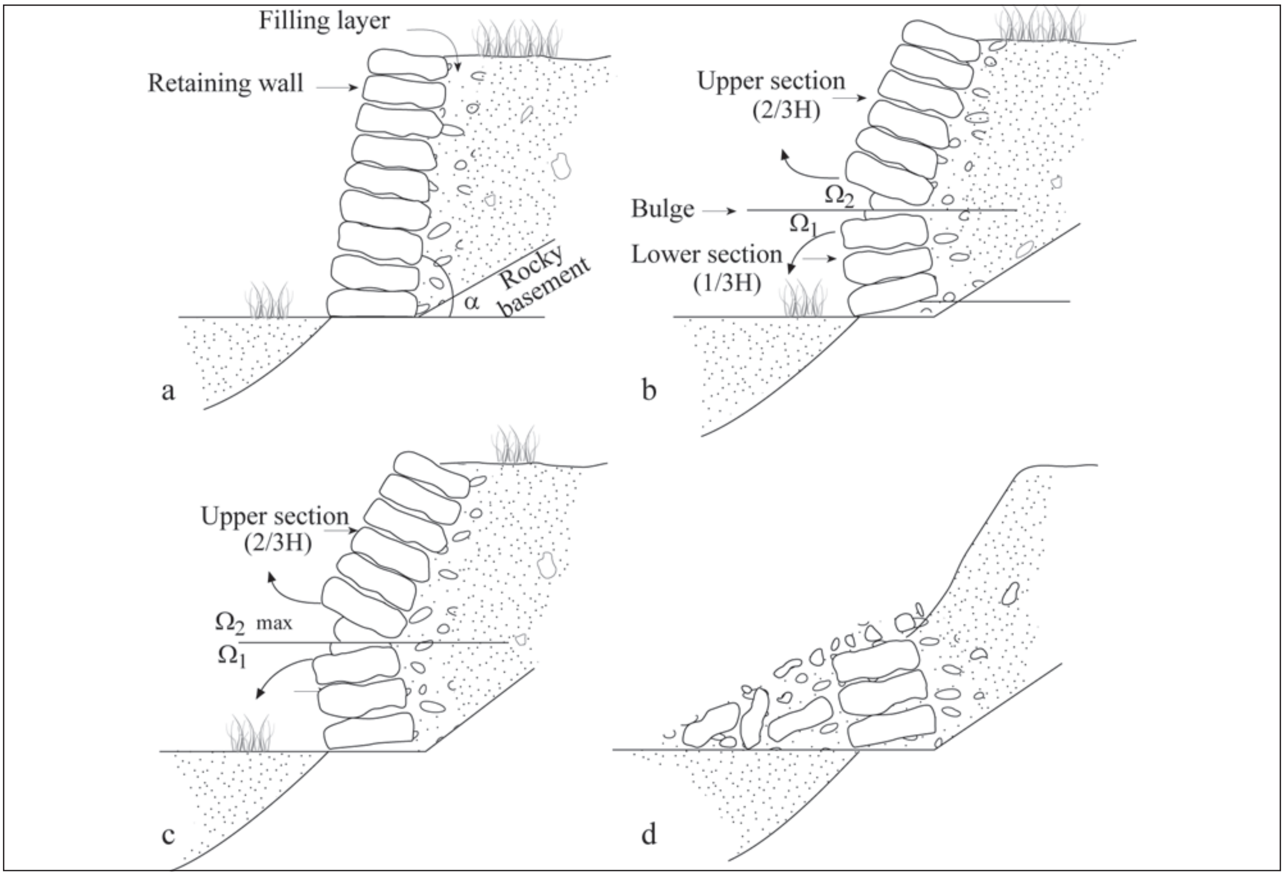


Figure 9: Stages in the process of wall collapse: a) retaining wall; b) bulge on the 1/3 lower section; c) bulge collapse; d) wall collapse.



Figure 10: A collapsed wall landslide.

schematic way the stages in the process of wall collapse. Maintenance is constant in the cultivated terraces, but manpower shortage affects the proper and constant reparation of wall stones slides. A similar process occurs in the Spanish Pyrenees, with the abandonment of cultivation in the mountain slopes even if terraced (Garcia-Ruiz, Lasanta-Martinez, 1990).

4. Shear stress field values for terraces soils

Shear stress values were found for terra rosa soils in the Yirca site in Israel under dry and wet conditions. Measurements were taken in field conditions by a specially designed equipment which proved to be effective. Soil was detached from the sides and the shear values of the soil were measured by the dynamometer.

Three main facts were evident: the cohesion of both soils was small; their angles of internal friction were large; and saturation caused a significant drop in their cohesion and only a slight decrease in their angles of internal friction. The large drop in soil cohesion after saturation is attributed to a drop in soil moisture suction.

Two kinds of failures were observed:

1. Wall collapse- without the soil behind the wall.
2. Sliding of the upper two thirds of a wall segment.

Two factors may be responsible for the small values of cohesion of both soils:

1. The abundance of stones in terra rossa.
2. The fact that both soils had never been over-consolidated in the past.

The large values of the angles of internal friction and the slight drop of these values after saturation were attributed to the high stone content of both soils (Zgaier, Inbar, 2005).

Saturation of terra rossa and rendzina, the soils of which the terraces in the study area are composed, caused a large drop in their cohesion and a slight drop in their angles of internal friction. The drop in the cohesion of terra rossa was larger than that of rendzina. The drop of cohesion due to saturation can lead to terrace landslides. The factors affecting terrace failure: soil pressure after heavy rains, cattle, animal or man destruction of the wall.

CONCLUSIONS

Erosion and sediment yield values occur during high magnitude rainstorms. Rainfall simulation tests showed that runoff and sediment yield were higher in the steep slope terraces and low in the cultivated and low gradient terraces. According to the rainfall simulation experi-

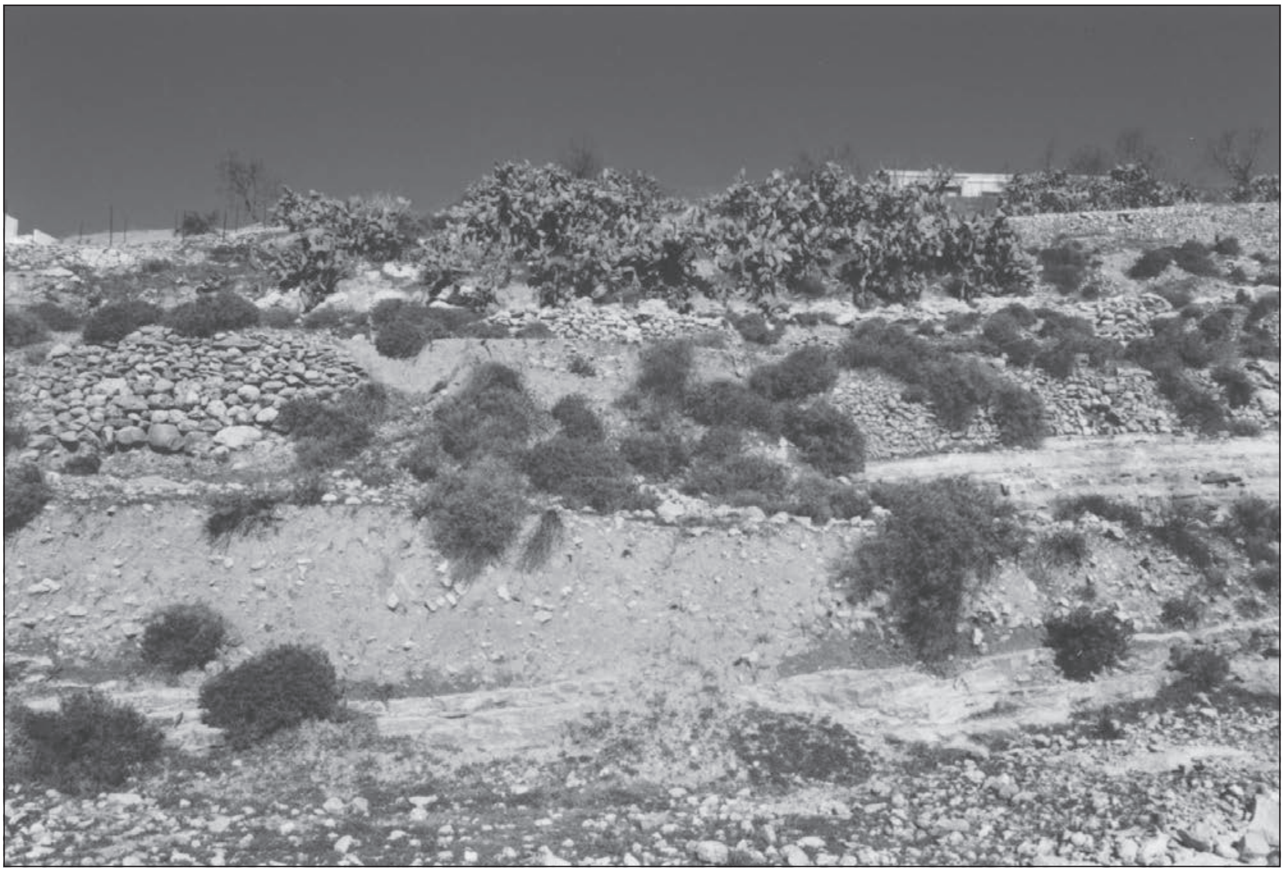


Figure 11: Landslides on collapsed terraces.

ments terra rossa soil is much more erodible than the rendzina soil.

Landsliding is one of the most important mass-wasting processes that affect agricultural hillslope terraces retained by dry built stone walls in Mediterranean regions (Figure 10). The built stone retaining wall is the critical part of the terrace, and its building requires knowledge and experience. Terrace landslides occur in winter during or immediately after heavy rains (Figure 11). Soil saturation affects the strength of the terrace soils, and the effect of the changes of soil strength on the stability of these terraces against landsliding**.**

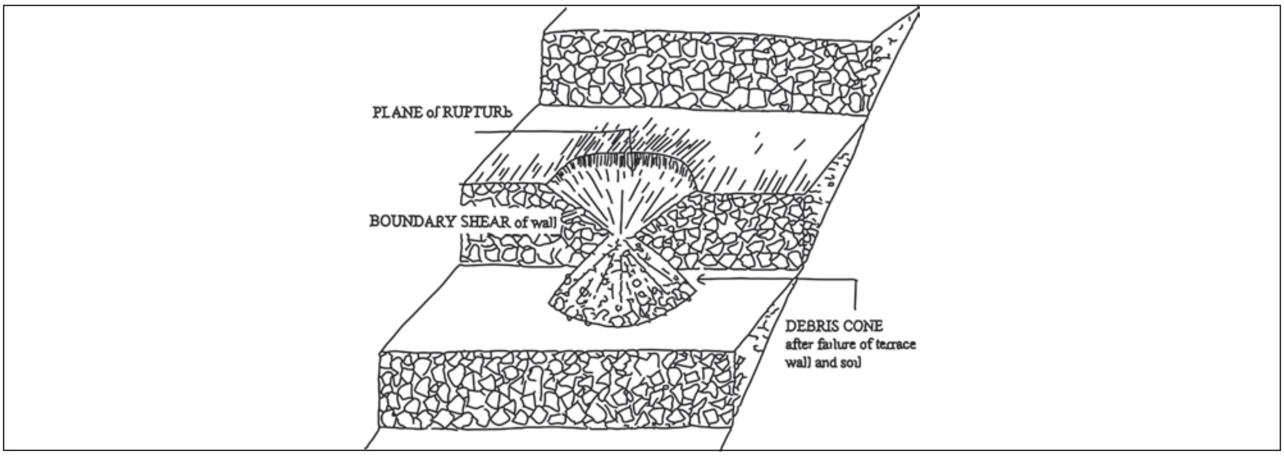


Figure 12: Schematic view of a collapsed terrace.



Figure 13: Recent debris cone formed after a heavy rainfall storm.

The total destruction of the terraces may take centuries but the process is irreversible. The wall are the crucial component of the terrace and their failure determines the destruction process (Figure 12).

In the Lower Galilee the old traditional agricultural practices were based on terraces farming. The urbanization process and low income from agricultural work brought to the abandonment of terraces and increased rates of erosion.

In the Judean hills, forested areas by the national forestry institution- the Keren Kayemet Leisrael- were formerly terraced. After forest fires, the recommendation by forestry and soil experts is to rehabilitate the old terraces and plant on them native trees species like oaks, that are more resilient to fire than pines.

Terrace degradation is a function of physical, economic and social factors, like land use and ownership, distance from the village, community strength, etc. The linkage between the biophysical land degradation has its roots in household and social behaviour. Soil erosion control by terracing is expensive because local labor shortage and was found to be the most expensive soil conservation technique under local conditions.

Socioeconomic factors in the Mediterranean hills and mountains are changing land use along with human behaviour. The self consuming traditional agriculture is changing to a market oriented economy for labor and agricultural production.

The traditional agricultural activity was formerly concentrated on terraced slopes. The difficulties associated with accessibility and use of machinery, the increase in labor costs, the high cost of maintenance and the extensive migration of people from rural to urban areas resulted in a progressive abandonment of part of the terraced land (Figure 13). Nevertheless, the actual price market of high quality wine and olive oil, together with a growing rural tourism interest have highlighted the need for restoration and conservation measures in the terraced land.

There is a gravitational process pulling down the young population of the mountain villages to more and diverse job and studies opportunities at the coastal cities. This brings to shortage of labor power for long term soil conservation practices like terrace and irrigation and ditches canal maintenance, leading to soil erosion from the abandoned traditional terraces. No soil will be transported back uphill and rural migrants will not go back to the mountain villages. Both gravitational pro-

cesses- soils flowing down from the mountain slopes to the sea floor and people migration from the villages to the coastal cities are linked and irreversible.

Like the large monuments in the world—Pyramides and Temples—old agricultural terraces are a real monument in the history of Man for the desire of life, and should be preserved as a cultural human heritage.

ACKNOWLEDGEMENTS

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FIZIKALNI IN DRUŽBENI VIDIKI DEGRADACIJE TAL NA TERASAH SREDOZEMSKIH VIŠAVIJ: GEODIVERZITETNI PRISTOP

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POVZETEK

Kmetijske terase spadajo med najpomembnejše sledi delovanja človeka na zemeljskem površju. Izgradnja teras povsem spremeni izvorne naklone naravnih pobočij. Na antropogeno ustvarjenih terasah se že več kot dve tisočletji nabira prst, ki je bila ekonomska osnova za razcvet uspešnih kultur. V pokrajinah vzhodnega Sredozemlja sega tradicija izgradnje terasiranih pobočij že vsaj v obdobje poldrugega tisočletja pred našim štetjem. Namen raziskave je bil raziskati mehanizme, ki vodijo v erozijo in uničenje kulturnih teras na območjih s sredozemskim podnebjem, s poudarkom na deformacijah podpornih zidov teras ter določitvi stabilnosti teras z vidika njihovih dimenzij. Testne ploskve za merjenje odtoka vode in količine erodiranega sedimenta so bile vzpostavljene na opuščenih in vzdrževanih kulturnih terasah. Vrednosti odtoka vode in erozije sedimentov so bile višje na strmejših pobočjih od vrednosti izmerjenih na položnejših terasah. V Sredozemlju je med najpomembnejšimi procesi odnašanja sedimentov na pobočjih s kmetijskimi terasami izdelanimi s suhozidi, plazenje tal. Poseganje človeka v že sicer ranljivo sredozemsko okolje pospešuje naravno erozijo gradiva in lahko privede do pogostejših in intenzivnejših geomorfnih dogodkov, kot so poplave, zemeljski plazovi in erozija prsti.

Ključne besede: kmetijske terase, degradacija tal, geodiverziteta, erozija prsti, sredozemsko podnebje

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ANALYSIS OF THE CONSEQUENCES OF THE EUROPEAN UNION CRITERIA ON SLOPE GRADIENT FOR THE DELIMITATION OF "AREAS FACING NATURAL CONSTRAINTS" WITH AGRICULTURAL TERRACES

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ABSTRACT

The paper highlights the important environmental, productive, social and cultural functions of agricultural terraced landscapes with a view to seeking special protection under the CAP for these areas, regardless their slope, size and so forth. We present the methodological difficulties facing policy-makers if slope is considered the only bio-physical criterion applied to terraced landscapes.

Keywords: Agricultural Terraces, Areas Facing Natural Constraints, Common Agricultural Policy, Less-Favoured Areas, Mountain Agriculture, Rural Development Policy

ANALISI DELLE CONSEGUENZE DEI CRITERI DELL'UNIONE EUROPEA RIGUARDANTI LA PENDENZA PER DELIMITARE LE "ZONE SOGGETE A VINCOLI NATURALI SIGNIFICATIVI" IN TERRAZZAMENTI AGRICOLI

SINTESI

Il documento evidenzia le importanti funzioni ambientali, produttive, sociali e culturali dei paesaggi terrazzati agricoli, indipendentemente dalla loro inclinazione, dimensioni, eccetera, e sostiene l'importanza della PAC per poter preservare queste aree. Si espongono infine le difficoltà metodologiche che i responsabili politici affronterebbero se la pendenza fosse considerata l'unico criterio bio-fisico applicato ai paesaggi terrazzati.

Parole chiave: Terrazze Agricole, Zone Soggette a Vincoli Naturali Significativi, Politica Agricola Comune, Zone Svantaggiate, Agricoltura di Montagna, Politica di Sviluppo Rurale

INTRODUCTION

Terraces have been built throughout history to expand agricultural land, to deepen soils, to prevent soil erosion and to retain water, among other purposes (Kemp et al., 2006; Ashkenazi et al., 2012; Haiman, 2012; Stanchi et al., 2012; Contessa, V., 2014; Jiang et al., 2014; recent historical studies in Spain: Torró, 2010; Trillo, 2010; Kirchner, 2011; Puy, Balbo, 2013; Boixadera et al., 2014; Fernández-Mier et al., 2014; Ferro-Vázquez et al., 2014; Quirós Castillo et al., 2014 numerous references therein; Retamero, 2015).

Terracing is the most widely used technique to provide agricultural land on hilly and steep slopes. Mountain areas cover 28.7% of the European Union (EU) territory, sheltering 16.9% of its population (ESPON 2013: III). Until 2014, the EU's Common Agricultural Policy (CAP) included terraced landscapes in the so-called *Less Favoured Areas* (LFAs). In the EU-27, 54.4% of its agricultural area was classified under this category (EC, 2013: 164); this area will certainly increase when we have the disaggregated data from Croatia, the last country to join the EU. In Croatia, 24.6% of its land is classified as agricultural use, including LFAs (MAFWM, 2007, 3, 12).

As a whole, 16.2% of the *Utilised Agricultural Area* (UAA) of the EU-27 fell within *Less-Favoured Mountainous Areas*. Besides these mountain' farmlands, *LFAs Other than mountains* were also distinguished. These included two categories: *Areas of Natural Constraints* (whose UAA reached 34.4% of the European agricultural area) and *Areas Affected by Specific Handicaps* (accounting for 3.8% of the UAA of the EU-27). Therefore, the three aforementioned categories accounted for 54.4% of the UAA in the EU-27, and all of them were considered as LFAs (EC, 2013a, 164-166).

LFAs aid beneficiaries had a significantly lower average income per Annual Work Unit compared with those with farms outside LFAs, specifically 31% less for *LFAs-Mountains* and 25% less for *LFAs Other than mountains* (EC, 2008:1). For example, if the average income per family work unit stood at around € 12,600 in 2011, this amount fell below € 10,000 in the mountainous regions of Northern Portugal and in the Italian region of Abruzzo (EC, 2014: 2). This also occurs in other European countries (Germany, p.e., Rudow, 2014). The percentage of labour devoted to farming in mountain regions is close to 14%, mainly in the South of Europe (Monfort, 2009), quite high compared to the average percentage devoted to agriculture in the EU-27, which is about 5% (EC, 2013b). The European Parliament defines most mountain farms as family-run with a "high financial risk" (European Parliament, 2010: 50), and LFA and agro-environmental payments represented on average 27% of the mountain farms' income (EC, 2009, 28).

However, the term LFAs, which has been used for years (EC, 1997), has now been completely removed from the new Regulation EU-No 1305/2013 on Support for Rural Development. In this Regulation, these territories are called *Areas Facing Natural and Other Specific Constraints* and their characteristics are defined in Article 32 (European Parliament and the Council, 2013). From 2014 onwards, as a result of the CAP reform guidelines, these territories have to face changes in their management. The changes include where Member States may allocate greater aid to *Areas Facing Natural and Other Specific Constraints* and to develop thematic sub-programmes for mountain areas (a revision in Asins, Romero, 2014).

On the other hand (and more importantly for terraced landscapes), a new delimitation of *Areas of Natural Constraints* based on eight biophysical criteria will be published, and come into force from 2018 (Böttcher et al., 2009; Eliasson et al., 2010; European Parliament and the Council, 2013: Annex III). The Commission of the European Community's reason for removing socio-economic objectives from the main aims of the Natural Handicap Payments (objectives included in previous years) was because it considered that there are more targeted measures for supporting farmers' income and competitiveness. Such measures are mainly promoted by rural development and cohesion policies (CEC, 2009).

In the preliminary literature, the Commission stated that an area could be considered affected by significant natural handicaps if a large part of its utilised agricultural land (at least 66%) meets at least one of the criteria listed above in Table 1 (CEC, 2009). However, for the purposes of this study, we focus on questioning the threshold of one of the biophysical criteria, namely that covering steep slopes. This criterion specifically affects agricultural terraced landscapes, especially in Mediterranean EU lands. In these countries, the following criteria could not be considered: *Low Temperature*; *Dryness* (met in only a very few specific locations in the southern mountains); *Climate and Soil*. With respect to the *Soil* criterion, farmers, have long used terraces to improve the *Limited Soil Drainage; the Unfavourable Texture and Stoniness; the Shallow Rooting Depth and the Poor Chemical Properties* of hillside fields. Thus, from 2018 onwards, *Steep Slope* will be the only criterion for designating a terraced agricultural landscape as an *Area Facing Natural Constraints*. Does the criterion "Change of elevation with respect to planimetric distance ≥15%" correspond to reality in the field? Would this threshold figure exclude many agricultural terraces that play an important role in farming, the environment (among other aspects), but that are very costly to maintain?

CRITERION: CHANGE OF ELEVATION WITH RESPECT TO PLANIMETRIC DISTANCE ≥ 15 %

Farmers have used different techniques to build terraces on steep slopes: dry stones, vegetative barriers, and so on. However, one thing they all have in com-

Table 1: Biophysical criteria for the delimitation of* Areas Facing Natural Constraints *(Source: European Parliament and the Council, 2013: Appendix III)

CRITERION	DEFINITION	THRESHOLD
CLIMATE		
Low Temperature (*)	Length of growing period (number of days) defined by number of days with daily average temperature > 5 °C or	≤ 180 days
	Thermal-time sum (degree-days) for Growing Period defined by accumulated daily average temperature > 5 °C	≤ 1 500 degree-days
Dryness	Ratio of the annual precipitation (P) to the annual potential evapotranspiration (PET)	P/PET ≤ 0.5
CLIMATE AND SOIL		
Excess Soil Moisture	Number of days at or above field capacity	≥ 230 days
SOIL		
Limited Soil Drainage (*)	Areas which are water logged for significant duration of the year	Wet within 80 cm from the surface for over 6 months, or wet within 40 cm for over 11 months or Poorly or very poorly drained soil or Gleyic colour pattern within 40 cm from the surface
Unfavourable Texture and Stoniness (*)	Relative abundance of clay, silt, sand, organic matter (weight %) and coarse material (volumetric %) fractions	≥ 15 % of topsoil volume is coarse material, including rock outcrop, boulder or
		Texture class in half or more (cumulatively) of the 100 cm soil surface is sand, loamy sand defined as: Silt % + (2 × clay %) ≤ 30 % or
		Topsoil texture class is heavy clay (≥ 60 % clay) or
		Organic soil (organic matter ≥ 30 %) of at least 40 cm or
		Topsoil contains 30 % or more clay, and there are vertic properties within 100 cm of the soil surface
Shallow Rooting Depth	Depth (cm) from soil surface to coherent hard rock or hard pan	≤ 30 cm
Poor Chemical Properties (*)	Presence of salts, exchangeable sodium, excessive acidity	Salinity: ≥ 4 deci-Siemens per meter (dS/m) in topsoil or
		Sodicity: ≥ 6 Exchangeable Sodium Percentage (ESP) in half or more (cumulatively) of the 100 cm soil surface layer or
		Soil Acidity: pH ≤ 5 (in water) in topsoil
TERRAIN		
Steep Slope	Change of elevation with respect to planimetric distance (%)	≥ 15 %

(*) Member States need only check fulfillment of this criterion against those of the thresholds that are relevant to the specific situation of an area

mon is that they are very labour-intensive, both to build and to maintain. Their cost-benefits analyses have been studied in different countries (Winter-Nelson, Amegbeto, 1998; Posthumus, de Graaff, 2005; Tenge et al., 2005; Kizos et al., 2010; Bizoza, de Graaf, 2012; Kumar, Chand, 2014). A recent study has estimated that the costs for reconstructing ancient dry stone terraces, in the Veneto region (Italy), varies between 130 and 189 €/m^2, depending on the wall height (1.50-2.50 m), carrier access, etc. (Lodatti, 2012, 121-122). This estimate could be lower in Spain but more expensive in other countries, for example in France, where the estimated average hourly/salary is higher than in Italy (EUROSTAT, 2015).

Some EU working documents on CAP reform raised the possibility of excluding areas for subsidies where farming has overcome natural handicaps; specially those where:

> *"Thanks to technical progress and human intervention, farmers have in several cases managed to overcome natural handicaps and are able to carry out profitable agriculture in areas where the natural conditions were at the origin quite unfavourable. (sic) In such cases, the intrinsic natural characteristics of the area remain unchanged, so on the pure basis of the biophysical criteria the area would be designated as severely constrained for agriculture. However, the handicap does not impact on agricultural productivity and there is no justification for classifying the area as affected by natural handicaps. The simulations made on the basis of these criteria should therefore systematically exclude: […] c) areas for which soil problems (soil texture, stoniness, rooting depth and chemical properties) are clearly overcome and where relevant production related indicators (average cereal yield or livestock density or standard gross margin per hectare) are comparable to the national average (excluding, where appropriate, mountain areas)" (CEC, 2009, 7).*

The document stated that the excluding such areas for subsidies would not affect mountain areas "where appropriate". Yet in hilly Mediterranean areas, farmers' use of terracing techniques (human intervention) mean that sizeable tracts are not currently affected by the biophysical criteria outlined in Table 1. Applying these criteria, only terraced fields on steep (≥15 %) slopes could be designated *Areas Facing Natural Constraints*. When the EU comprised 15 countries, the length of linear features (for example, stone walls), was estimated at 1,717,454 km (EC, 2005, 192; recent disaggregated data for Italy in Agnoletti et al., 2015). How many of those kilometers are on slopes ≥15%?

We have to remember that terrace agriculture, apart from boosting farming yields, has also made impressive social, cultural and environmental contributions (Harfouche, 2007; Varotto, 2008 and 2014; Lasanta et al., 2010; Hernández, Morales, 2012; Giménez-Font, 2013; Murtas, 2013; Asins, Romero, 2015; FAO, 2015; Monger et al., 2015; Arévalo et al., 2016). However, although this technique is resilient (Solé-Benet et al., 2010), it is also vulnerable to physical and chemical degradation (Romero-Martín et al., 1994; Chen et al., 2007; Goodman-Elgar, 2008; Martínez-Casasnovas, Ramos, 2009; Calvo-Cases et al., 2011; García-Ruíz, Lana-Renault, 2011; Romero-Díaz et al., 2011; Gispert et al., 2013; Schönbrodt-Stitt et al., 2013; Lasanta, 2014; Tarolli et al., 2014; Arnáez et al., 2015; Ažman, Kladnik, 2015; Romero-Díaz, 2016) and very expensive to maintain and to repair, both (i) in labour and money terms, if farmers opt for to restore the dry stone structures, or (ii) in labour, if they use natural or autogenic succession' repair processes, which requires periodic maintenance and long-term planning (LaFevor, 2014).

CAP 2014-2020 allows Member States to allocate aid for *Areas Facing Natural Constraints* according to their needs; so the consultation of regional and local authorities on the criteria for identifying the aid-recipient regions is essential. In this sense, in order to provide scientific information to stakeholders at local and regional level, urgent consideration needs to be given to the steep slope criterion (*Change of elevation with respect to planimetric distance ≥15 %*) and its practicality in the field. One also needs to ascertain whether policymakers at the local and regional levels could easily obtain the information required. Even though the case study we present is the Valencian Community (Spain), the results are applicable to other Mediterranean agricultural terraced landscapes.

DATA SOURCES AND METHODS

In order to estimate the area potentially affected by the 15% slope threshold, two Digital Elevation Models (DEM) of 5 and 25 meters in resolution were used. Both come from the same data source (LiDAR flight realised in 2009) and are provided by the Instituto Geográfico Nacional (IGN, 2016). The 25 m (DEM) underestimates the total area at and over the 15% gradient threshold by 3% so all the work has been done using the 5 m resolution DEM. According to DEM, the area ≥15% in slope makes up 50.7 % of the Valencian Community territory. In order to obtain the agricultural area on steep slopes ≥15%, the resulting slope map has been crossed with the land use map (*Sistema de Información sobre Ocupación del Suelo de España - SIOSE*) dating from 2011. Before it, the SIOSE map (originally as vector polygons) was rasterised to the same resolution as the DEM and specially adjusted using ArcGIS v10.2. The map in Figure 1 shows in raster format of 5 m resolution, the areas cultivated in 2011 divided in two categories: ≥15% (in dark) and <15% (in light grey). Three zooms in this map (Figures 2, 8 and 9) are made on selected areas overlapping 2012 images, in order to give a better image of the problems in considering such a slope threshold.

DISCUSSION

The SIOSE land use map drawn up through photointerpretation estimates of the proportion of cultivated area in each polygon, as well as the proportion of the area with agricultural terraces. Figure 1 shows the spatial distribution of the cultivated areas (with some proportion of crops) over and under the slope threshold. Table 2 summarises the results taking these proportions into consideration in the SIOSE mapping. This Table shows

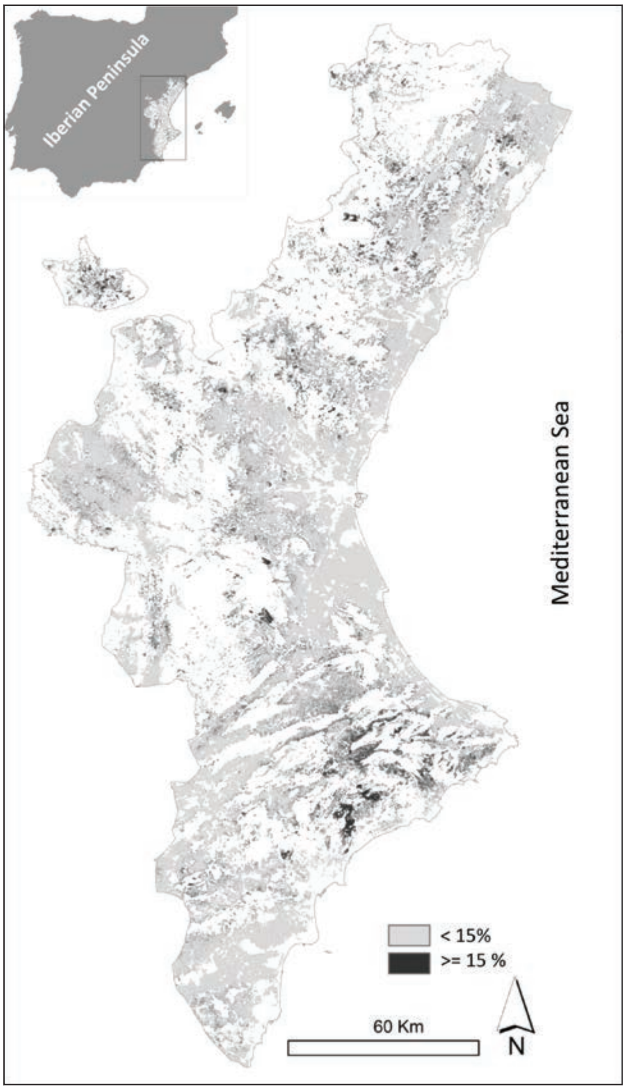


Figure 1: Spatial distribution of the cultivated areas (with some proportion of crops) over and under the 15% proposed slope threshold for designating* Areas Facing Natural Constraints *(Source: SIOSE, 2011 and 5m in resolution Digital Elevation Model, provided by the Instituto Geográfico Nacional de España).

that only 16.02% of the cultivated area is on slopes over the threshold proposed by the *Biophysical criteria for the delimitation of Areas Facing Natural Constraints*.

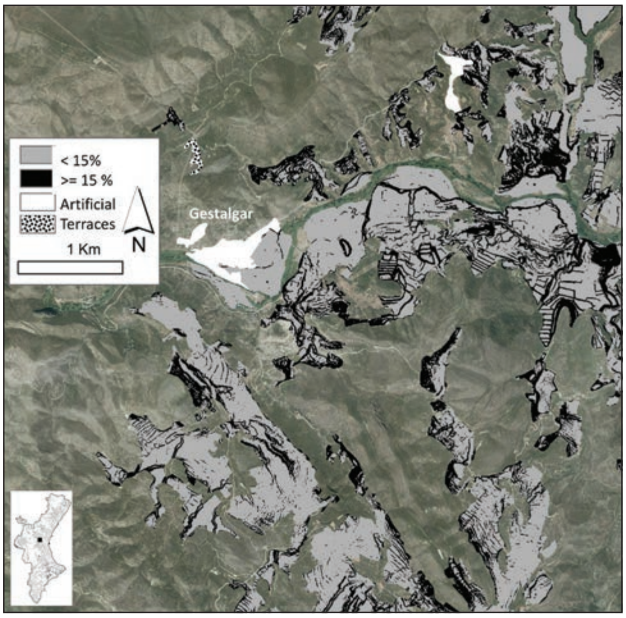


Figure 2: Cultivated area in the surroundings of Gestalgar village over and under 15% slope threshold and location of agricultural terraces (the small patch at the NW of the map), however this technique is distributed through all the agricultural area visible by the presence of lines over the 15% threshold inside the <15% slope patches.

Thus applying the ≥15% slope criterion, policymakers could designate only 16.02% of the total farming area in the Valencian Community as agricultural *Areas Facing Natural Constraints*. Yet in this mountainous Community, most agricultural fields are arranged in terraces. In the Valencian Community, there is legislative protection for agricultural areas. It is possible to declare a *Protected Agricultural Rural Area* if this exhibits one or more of the following: agricultural values; a rural setting of special social, cultural and/or landscape value; agricultural importance (GV, 2014: Annex IV). The question is, what would be appropriate if historic terraced landscapes were declared protected and subsidised with lines of aid facilitating their maintenance?

However, even if the Valencian Community's policymakers chose to include all the terraced areas as eligible for aid, the information provided by SIOSE will

Table 2: Surface and proportion of the cultivated areas under and over the ≥ 15% Slope threshold obtained from the map in Figure 1.

CULTIVATED AREA	**SURFACE** (ha)	**SURFACE** (%)
Of total Valencian Community	684 659.48	29.42
On slope < 15 %	574 945.75	83.98
On slope ≥15 %	109 713.73	16.02

Table 3: Inaccurate information provided by SIOSE, 2011 with respect to terraced areas in the Valencian Community.

CULTIVATED AREA	**AGRICULTURAL TERRACES** (%)
Of total Valencian Community	2.42
On slope <15 %	5.08
On slope ≥15 %	24.74

prove useless for this purpose. Figure 2 illustrates the poor mapping of the agricultural terraces on the SIOSE. In an area where all farming is on terraces (lines of black pixels show slopes of over 15%) only a small patch has been mapped as terraces at the NW corner of Figure 2. According to the SIOSE map, only 2.42% of the agricultural areas of the Valencian Community is affected by terraces (Table 3) but this is inexact. It should be checked because most of the agricultural areas in this area (past and present) are on flat land obtained by terracing. The SIOSE shortcomings is identifying terraces as especially noticeable on slopes <15%. Nowadays, more accurate methods can be used to identify agricultural terraces (Galleti et al., 2013; Díaz-Varela et al., 2014; Sofia et al., 2014; Sofia et al., 2016) however their application will need specialised technicians working in public administration. Furthermore, the SIOSE was compiled in 2011 and will need continuous up-dates.

AREAS FACING NATURAL CONSTRAINTS SHOULD INCLUDE ALL TERRACED LANDSCAPES

The first problem that policymakers have to solve is whether the 15% slope (that is to say *Change of elevation with respect to planimetric distance ≥15%*) reflects realities in the field and serves to define Areas Facing



Figure 3: Small terraced properties (under 2 or 3 hectares) not included in the Areas Facing Natural Constraints. Sella (Alicante). Photo: P. Giménez-Font.

Natural Constraints. There is enough research in favour of protecting terraced landscapes to justify not only the inclusion of areas with slopes ≥15% but also conservation of terracing techniques in general. Hence the need to conserve agricultural fields on terraces (whether they fall above or below the 15% threshold). Our reasons for making this recommendation include the following:

1) Terraced areas with a slope ≥ 15%

Considering the biophysical criteria, these areas should receive this aid but in practice, many farms could be excluded. The reason is that, in addition to the biophysical criteria, farms tend to be small (Figure 3). This implies that they may not reach the two or three hectares required by the legislation, depending on the country. Thus, although such smallholdings might fulfil the *Steep slope* criterion, they would fail the *Size* test and so be ineligible for aid. This means most farmers would end up having to foot the cost of protecting the landscape and the wealth of flora and fauna fostered by traditional farming practices. Here, one should note that good farming practices can help conserve flora and fauna (roughly 50% of European species depend on agricultural habitats, EEA, 2006). Other ecosystem services have been recognised for years, such as carbon sequestration, maintaining soil fertility, regulating of the dynamics of insect pollination and so forth (Barrios, 2007; Goldman et al., 2007; Dale, Polasky, 2007; Swinton et al., 2007; Zhang et al., 2007; Downing et al., 2008). Scientists have also highlighted the importance of agricultural terraces as ecological corridors (Hargrove et al., 2004; Grashof-Bokdam, Langevelde, 2005; Donald, Evans, 2006; Kindlmann, Burel, 2008; García-Llorente et al., 2015; Iniesta-Arandia et al., 2015).

2) Historical orchards (slopes <15 %)

These historic orchards are found on slopes <15% but play a key roles in social (labour), productive (nearby market), ecological (vegetation associated with crop fields) and cultural (heritage preservation) terms. Considering the biophysical criteria, these agricultural terraces will not be eligible for aid (Figure 4). Today, approaches on cohabitation and hybridisation of agricultural production models are being defended. That is because they help conserve family agriculture to ensure the continuity of rural areas (recent studies will be published as a result of the colloquium *La renaissance rurale d'un siècle à l'autre?*, *Journées Rurales 2016 and 25*



Figure 4: Historic terraced orchards. Chelva (Valencia). Foto: F. Jarque.



Figure 5: Agricultural terraced "island" spared by a forest fire. Dos Aguas (Valencia), July 2012 (Photo: J. García--Pausas).

ans de dynamiques rurales, held in Toulouse, France, in May 2016).

3) Agricultural "islands" inside forests (slopes <15 %)

The way terraced fields slow down the spread of forest fires has been well studied (Lourenço, Nave, 2007; Galtie et al., 2007). However, this important function is not included in the elegibility requirements for aid in *Areas Facing Natural Constraints*. In the Valencian Community, there are municipalities that are ringed by mountains and where terraced fields slow down advancing wildfires. Among these municipalities, we highlight those in the Sierra de Espadán Natural Park (Castellón). In that area, small villages such as Aín and Alcudia de Veo are ringed by abandoned fields that are overgrown with brush. This greatly increases the risk of forest fires reaching houses and endangering lives. Furthermore, some of the farmed areas next to the villages are under the slope threshold (≥ 15%) and a policy of conserving traditional agricultural practices near settlements and along roads will help defend towns and villages against fires (Figures 5-7).

4) Peri-urban agriculture in terraces as buffer zones (slopes <15%)

In Figure 8, the area surrounding the towns of Petrer and Elda (Alicante) shows a landscape dominated by rocky outcrops. Here, most of the cultivated areas are under the threshold <15% but all fields are terraced. The aridity of the area makes wildfires less common. Here, conserving agricultural areas next to the town should be seen as a way of keeping traditions and nearby markets in a dense industrial area (Figure 8). These lands epitomise the "territorial agriculture" (González Regidor, 2000, 2003; Esparcia, Escribano, 2012), with small family farms sited in areas with physical constraints and/or of special economic/environmental value. These fields have to be protected from urban and industrial sprawl (Reig et al., 2016).

5) Historical agricultural terraces (slopes ≤ 15%)

In addition to the reasons already cited, one should not forget that Mediterranean terraced areas below <15% slope represent a secular heritage that should be protected, based on the same arguments already given for "territorial agriculture" (Figures 9-10).

CONCLUSIONS

Over the last half-century, nearly 30 million hectares of farming land has been abandoned in the European Union (Pointereau et al., 2008, 27). The new economic post-productive context and deep social and cultural changes encourage the development of new policies in



Figure 6: Aín (Castellón), located inside a Natural Park, and surrounded by forest. To preserve the agricultural terraced areas with a slope <15% could help in the event of forest fires.

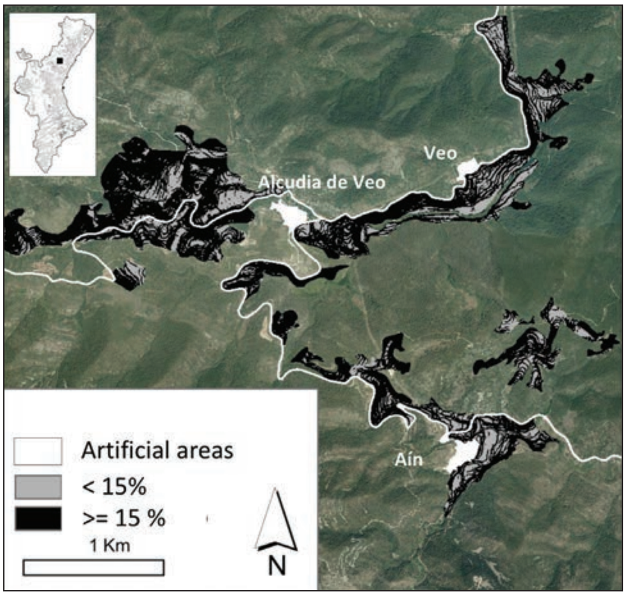


Figure 7: In areas like some villages inside the Natural Park of Sierra de Espadán (Castellón) all ancient agricultural terraces near the villages need to be protected to preserve the population from forest fires. Terraces create spatial discontinuity with hillslope parts over and under 15 % threshold.

relation to European rural areas. It is forecast agricultural abandonment could affect 3-4% of the EU land area in the period up to 2030. This loss will be most marked in the Pyrenees, the Massif Central, the Apennines, the Alps, the Harz, Elbe Sandstone Mountains [Elbsandsteingebirge], the Thuringian Forest in Germany, and the Erzgebirge, in the Bohemian Forest (spanning the border between Germany and the Czech Republic) and to a lesser extent in the Carpathians (Keenleyside, Tucker 2010, 62, 76; IEEP and Alterra 2010: 6-7). In the EU-27 (data from Croatia are not available yet) 54.4% of the UAA is considered as a disadvantaged area. That means that the criteria for defining the new category of *Areas Facing Natural Constraints* must include the wide range of the previous categories of *Less Favoured Areas* and reflect the situation on the ground in each EU Member State.

In addition to their territorial and environmental dimensions, European rural landscapes are also (and sometimes above all) culture, history, collective memory, identity and legacy. These are the reasons why public policies boosting territorial and landscape functions are slowly gaining ground. Terraced agriculture should be included as a landscape category in the *Areas Facing*

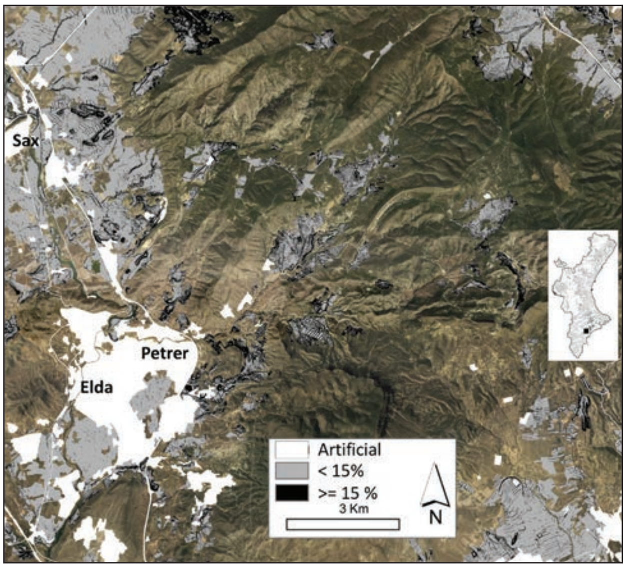


Figure 8: Agricultural terraced fields surrounding a dense industrial and populated Area in a mountainous area (Elda-Petrer, Alicante).



Figure 9: Culla (Castellón).



Figure 10: Villafranca (Castellón).

Natural Constraints. Taking into account the productive, environmental, social and cultural functions of terraced landscapes, a special set of measures terraced fields should be drawn up as part of the EU's Common Agricultural Policy. This would not only benefit farmers who work more than two or three hectares on slopes ≥15%, but all those who farm hillside fields using this technique of soil and water conservation, regardless of the steepness of the slope or field size.

Such a conservation policy should go hand in hand with the concept of territorial agriculture. This is because rural development is more a territorial issue than a sectoral one. Development must be encouraged, organised, and based on an appropriate territorial level in terms of culture, identity and networks. Such a trend is in keeping with territorial multifunctionality, and growing public demand for an end to unsustainable agricultural practices and for EU policies that foster cultural values, territorial identity, and the landscape. This is why instruments need to be drawn up for protecting, managing, and planning of all landscapes.

To achieve the protection of all historical terraced landscapes, Member States should present an exhaustive catalogue of such lands with a view to improving landscape policies in mountain areas. The EU could then draw up a master plan, including local participative management and link this to local landscape planning.

ANALIZA POSLEDIC MERIL EVROPSKE UNIJE O NAKLONU ZA RAZMEJEVANJE »OBMOČIJ Z NARAVNIMI OMEJITVAMI« Z OBDELOVALNIMI TERASAMI

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POVZETEK

V številnih hribovitih sredozemskih občinah so vsa kmetijska zemljišča na pobočnih terasah. Od leta 2018 se bodo v skladu s smernicami skupne kmetijske politike (CAP) Evropske unije »območja z naravnimi omejitvami« (prej »območja z omejenimi možnostmi«) razmejevala na podlagi osmih biofizikalnih meril. Ta merila so precej omejujoča, zlasti za sredozemska terasirana območja, saj morajo kmetovalci poleg izpolnjevanja merila naklona ≥15 % imeti najmanj 2 ali 3 hektare, kar je odvisno od posamezne države. V članku so predstavljene produktivne, okoljske, socialne in kulturne funkcije teh terasiranih pokrajin ter priporočilo, da bi morala skupna kmetijska politika ohranjati in podpirati tradicionalno terasasto obdelovanje zemlje ne glede na naklon terena ali velikost njiv. Te funkcije so tako pomembne, da bi bilo treba njihovi zaščiti nameniti posebno podporo. Članek poudarja tudi metodološke težave, na katere lahko naletijo oblikovalci politik pri določanju zgornje meje naklona 15 %, saj bo morda treba dodelati aktualne zemljevide.

Ključne besede: obdelovalne terase, območja z naravnimi omejitvami, skupna kmetijska politika, območja z omejenimi možnostmi, hribovsko kmetijstvo, politika za razvoj podeželja

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DISCOVERING TERRACED AREAS IN SLOVENIA: RELIABLE DETECTION WITH LIDAR

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ABSTRACT

LIDAR data offer an unprecedented accurate new interpretation tool for detecting terraced landscapes. The boundaries of terraced areas in Slovenia cannot be clearly defined without the help of a field survey even when the configuration of the terrain makes surveys difficult. The segmentation of point cloud data into various classes of foliage, ground, buildings, and so on makes previously hidden earthwork structures (including abandoned terraces) instantly recognizable. The conceptual shift is that the LIDAR slope analysis layer is more revealing and instructive for discovering terraces areas than orthophoto images ever were. Although LIDAR data are a new tool in the search for terraced areas, orthophotos remain important but are nevertheless only a contextual aid. A quantitative comparison between the old and new methods shows no difference in three pilot areas, shows only a minor difference in two cases, and reveals major differences in three pilot areas. The quantitative differences in some of the pilot areas are compelling. However, the most significant feature of the new method is its reliability for detecting the exact boundaries of terraced areas.

Keywords: terraced areas, terraces, LIDAR, digital terrain model, Slovenia

LOCALIZZAZIONE DI AREE TERRAZZATE IN SLOVENIA: RILEVAMENTO ATTENDIBILE CON IL LIDAR

SINTESI

I dati prodotti con la tecnologia LIDAR si presentano come un preciso strumento interpretativo, nuovo e senza precedenti nella localizzazione di paesaggi terrazzati. In Slovenia, l'identificazione dei confini di aree terrazzate richiede sistematicamente l'aiuto di indagini sul campo, anche quando la configurazione del terreno rende tali indagini difficili. Con la segmentazione dei dati a nuvola di punti nelle categorie del fogliame, suolo, edifici ecc. le strutture di terrapieno precedentemente nascoste (incluso terrazze abbandonate) risultano subito riconoscibili. L'innovazione concettuale del LIDAR sta nel fatto che il suo livello delle analisi di pendenze è più rivelatore e informativo per la localizzazione di terrazze di quanto non lo siano mai state le immagini ortofoto. Ciò non toglie che le ortofoto rimangono un aiuto importante nella ricerca di aree terrazzate, anche se meramente contestuale. In tre delle aree pilota in cui sono stati eseguiti i rilevamenti, i risultati non hanno evidenziato nessuna differenza quantitativa tra il vecchio e il nuovo metodo, in due aree si è osservata una minima divergenza, mentre in tre aree pilota le differenze sono state notevoli, in alcuni casi straordinarie. Comunque, la funzionalità distintiva del nuovo metodo sta nell'attendibilità della localizzazione dei precisi confini di aree terrazzate.

Parole chiave: aree terrazzate, terrazze, LIDAR, modello digitale del terreno, Slovenia

INTRODUCTION

In recent years, growing local and international attention to terraced systems has stimulated the demand for GIS to map the size and distribution of terraces (Varotto, 2014, 295). Research on terraced areas is also gaining momentum in Slovenia. A crucial year in terrace research was 2005, with the start of the transnational EU project INTERREG IIIB, titled Terraced Landscapes in the Alpine Arc (or ALPTER). The Slovenian partner was the University of Ljubljana's Faculty of Architecture.

The research project contributed to the comprehensive development of various methods for cataloging and studying terraced areas. Some of the partners were already using advanced methods of cataloging and analyzing terraced areas. For studying countermeasures against erosion and terrace collapses in Italy's Brenta Valley, the researchers used a point cloud, which they obtained from LIDAR data (Nimfo, 2008) as early as 2002. At the time, this was an advanced technique for gathering data. The researchers had to deal with data interpretation, high equipment costs, time-consuming computations, and undeveloped algorithms for cleaning the point cloud. The data were acquired in an area where the terraces are partially abandoned but still very recognizable in the landscape because of the dry-wall construction that defines them. The final digital elevation plan is a clear and precisely drawn map that shows the geometry of the terraces in the pilot area. This confirmed the technology's ability and advantages for studying terraced areas.

"LIDAR, which stands for Light Detection and Ranging, is a remote sensing method that uses light in the form of a pulsed laser to measure ranges (variable distances) to the Earth. These light pulses—combined with other data recorded by the airborne system— generate precise, three-dimensional information about the shape of the Earth and its surface characteristics. A LIDAR instrument principally consists of a laser, a scanner, and a specialized GPS receiver. When an airborne laser is pointed at a targeted area on the ground, the beam of light is reflected by the surface it encounters. A sensor records this reflected light to measure a range. When laser ranges are combined with position and orientation data generated from integrated GPS and Inertial Measurement Unit systems, scan angles, and calibration data, the result is a dense, detail-rich group of elevation points, called a "point cloud." Each point in the point cloud has three-dimensional spatial coordinates (latitude, longitude, and height) that correspond to a particular point on the Earth's surface from which a laser pulse was reflected. The point clouds are used to generate other geospatial products, such as digital elevation models, canopy models, building models, and contours. Two types of LIDAR are topographic and bathymetric. Topographic LIDAR typically uses a near-infrared laser to map the land, while bathymetric lidar uses water-penetrating green light to also measure seafloor and riverbed elevations" (Internet 4).

The publication *Terraced Landscapes of the Alps: Atlas, Alpter Project* (Scaramellini, Varotto, 2008) included the paper "Mapping and Geological Classification of Terraced Landscapes: Problems and Proposals" (Varotto, Ferrarese, 2008), in which the authors sought to introduce a new term: *terracing size index*. In the study, the researchers cite a previous classification of terraced areas by size (Scramellini, 2005). Scramellini divided terraced landscape into the following ranges: 1) micro-terraced landscapes (0–0.33 hectares), 2) mezzo-terraced landscapes (0.33–0.66 hectares), and 3) macro-terraced landscapes (0.66–1 hectares). On this basis, Varotto and Ferrares created an additional classification of the intensity of terraced landscapes based on the relation to drywall per hectare, and they obtained the following classes: low intensity (5–200 m/ha), medium intensity (200–800 m/ha), and high intensity (> 800 m/ha). The authors concluded that this research has a number of limitations. The first and the most significant limitation is that this classification method works only with areas already catalogued and is prone to oversimplification of results. It also focuses exclusively on terraces with drywall construction. Moreover, it does not take into consideration terraces made of earth and it does not take into account the sizes of terrace surfaces.

One of the most important results of the ALPTER project is the design of a platform for a content-based database of catalogued terraced areas. The database was devised in such a way that contributions would be part of a private-public partnership with a detailed structure. It works at two levels. The first level (the Datasheet for Analysis of Terraced Areas) is meant to accommodate large areas and has a larger territorial scale of 1:25,000. The second level is at a more detailed 1:5,000 scale. A number of different criteria are introduced: location, historical data, land use, the structure of terraced areas, and several others.

The data prepared in this way were also part of the publication *Terraced Landscapes of the Alps: Atlas: Alpter project* (Scaramellini, Varotto, 2008). The structure of the database was ambitiously set. In its complete form, it is complex and therefore intended for research purposes. Only its most basic parts are intended for gathering data through public participation. The most important part of this data gathering is defining the exact borders of terraced areas. The basic underlay for visual definition through a web interface is aerial images. These are flat and do not contain any elevation data, and so they are prone to the interpretation of the individual participant in the survey. The exact borders of terraced areas based on orthophoto images can then be anyone's guess.

For the scientific study of terraced areas, exact and systematic data input is essential. The team from the University of Ljubljana surveyed terraced areas in the

Municipality of Brda, which has an area of 72 km², from 2006 to 2008. The area is composed of fifteen cadastral units further divided into forty-five settlements. This was the first time that the researchers processed data with such content in such a wide region in Slovenia. Unlike today, GIS technologies and the techniques for gathering and processing large amounts of spatial data were relatively unknown. The base layers were inconsistent and therefore a field survey was required. The most important underlay was a grayscale Ortofoto image: a series of geometrically corrected aerial images with a resolution of 0.5 m by 0.5 m. During the project, a color orthophoto became available and was used to complete the project.

The extent of the municipality consisted of thirty-four geo-positioned orthophoto images at a scale of 1:5,000, each covering an area of 2.25 km by 3 km. With this data as the main underlay, the first digital vector layer of potential terraced areas was defined. The chosen area is intensely agriculturally developed, consisting mostly of vineyards, orchards, and olive groves, creating a uniform landscape pattern. The basic orthophoto layer does not provide all of the data needed to accurately determine the boundaries of the terraces. Because of the lack of precise elevation data, the new layer of potential terraced areas needed to be verified through fieldwork. The terrain configuration and intensity of agricultural production made almost all of the terraced areas in the southern and central part of the municipality easily discernible and readily accessible. The northern part of the municipality was more challenging due to its dynamic terrain profile being less agriculturally developed and less easily accessible. Most of the terrain of the municipality consists of hills covered in terraces; the rare flat areas contain vineyards without terraces. Fieldwork confirmed or rejected the interpreted boundaries in the draft layer. In the end, this process resulted in a highly accurate representation of the extent of terraced areas in the municipality. The fieldwork turned out to be very time-consuming and took a team of four more than two years to complete. Although a variety of other GIS layers were collected, none were used for determining terraced areas.

The first World Conference on Terraced Landscapes took place in Honghe, Yunnan (China) in 2010, at which the Honghe declaration on the protection and development of terraces was signed. At the same time, the ITLA (International Terraced Landscapes Alliance) umbrella organization was established (Ažman Momirski, Kladnik, 2015), which gathers together all researchers and activists interested in cooperating to protect, study, and develop terraced areas globally. The second World Conference on Terraced Landscapes took place in Peru in 2014. At the conference, Mario Varotto presented the study "From GIS to Participatory GIS for Trans-Local Cooperation: The Terraces Project for Mapping, Shar-

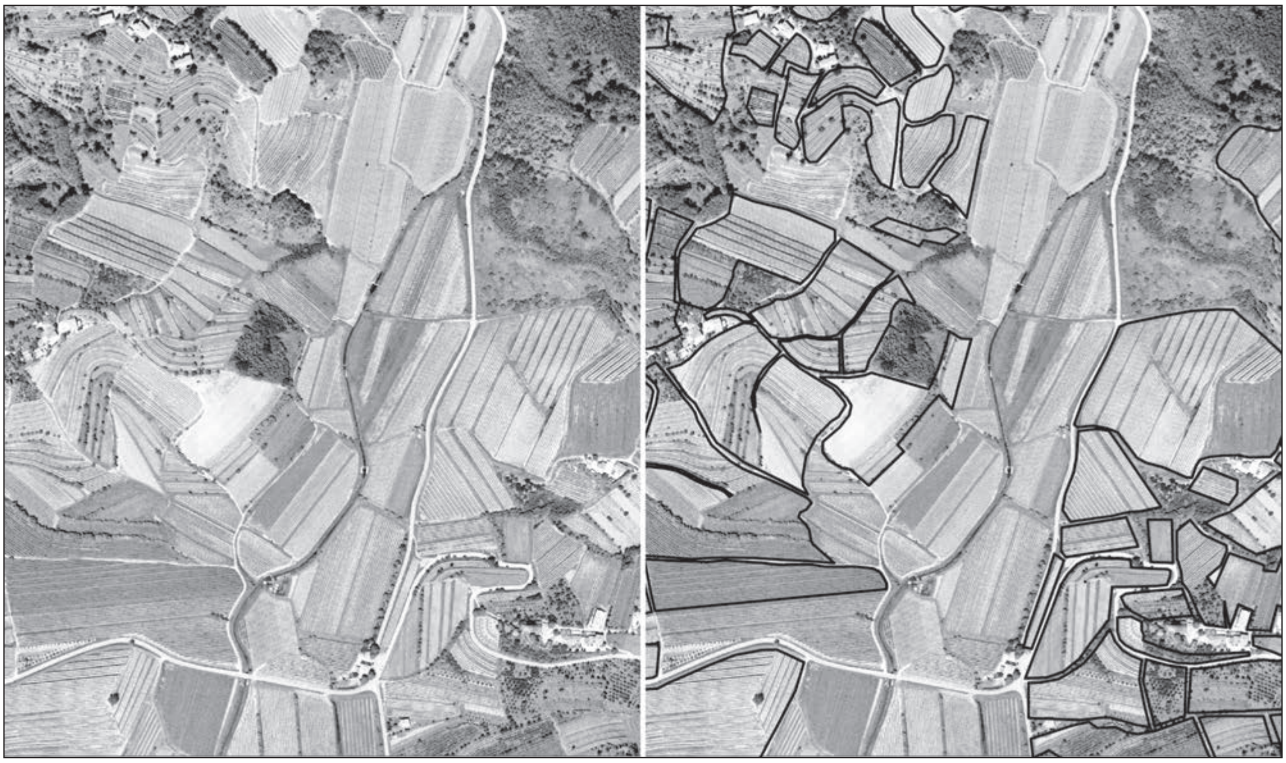


Figure 1: Orthophoto image with terraced landscape boundary in the Municipality of Brda (2008). The uniform landscape pattern does not indicate which areas are flat and which are terraced.

ing, and Sustaining Terraced Landscapes." The activity is considered an improvement and implementation of the project results of the ALPTER-based development platform for recording terraced areas. As Varotto states, the platform is the first P-GIS (Participatory Geographic Information System) platform of this kind. It aims to form trans-local connections and will initially be introduced as a trial in Italy under the Italian ITLA. After the initial local implementation, the authors are seeking global support. It is a social network of terraced landscapes and it is striving to attract all owners of terraced areas to create their own profile, enroll, and input their data. In this way, terraced areas can be enriched with various content to obtain information for local authorities, agricultural agencies, universities, tourism, and shops. Public participation in the database should be limited only to the substantive component because it turns out that, due to the influence of many factors, the exact boundaries of terraced areas cannot be determined without a predetermined method. Even the content is problematic in terms of privacy. Another issue for these databases is who will monitor the public data entered to ensure that it is precise.

A reasonable step would be for the terraced landscape attribute to become a constant in the land-use database. This would truly be a significant step forward because it offers an additional perspective on influences that it has on the surrounding landscape, such as erosion, food production, and tourism.

After the ALPTER project, knowledge expanded and various technology became more widely used for analyzing, identifying, and cataloging terraced areas. LIDAR technology in particular became widely available and widely used. "Developed just a few years ago, LIDAR

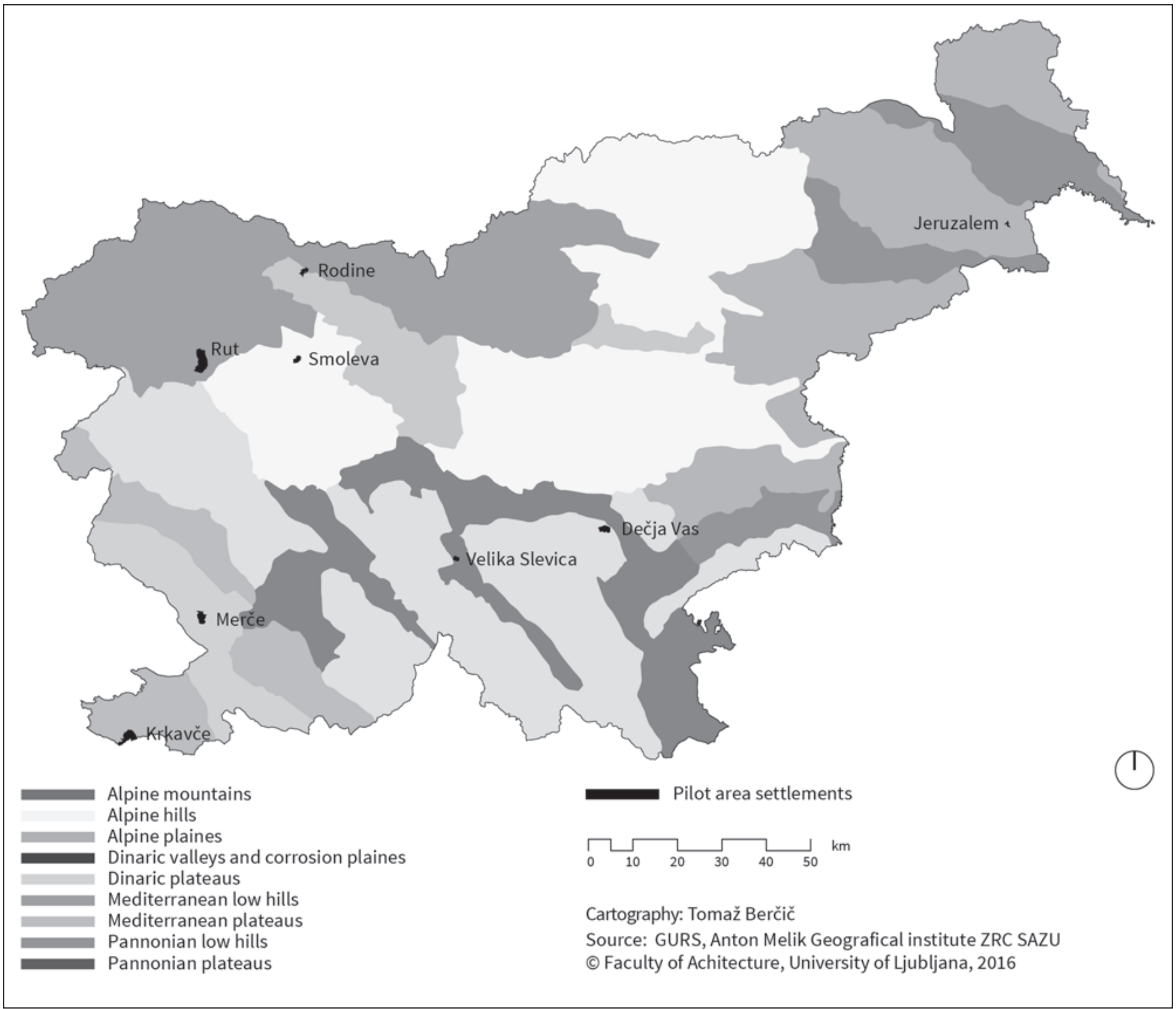


Figure 2: Slovenian territory divided into nine natural landscape types with names of selected pilot settlements.

technology has aroused great interest among those involved in the study or management of the territory" (Ninfo, 2008, 28). The density of the data gathered and used by Italian researchers in 2002 was from one to 1.5 points per square meter. Along with relatively weak data, these researchers also had difficulty with problems of pure processing ability and underutilized algorithms for cleaning the point cloud data. In the meantime, the technology matured in both aspects. In 2011, Slovenian government agencies commissioned the laser scanning of the country's territory with a resolution between two and ten points per square meter. However, this was only a dry run because only a few areas were processed and available for research purposes in the southwest Mediterranean part of Slovenia and in the northeast, near Maribor. In cooperation with the Ministry of the Environment and Spatial Planning, the Slovenian Environment Agency commissioned LIDAR data for the entire territory of Slovenia and publicly released this information for public use in 2015 (Internet 1). For capturing LIDAR data, the latest technology was used, which is able to capture up to twenty-four points per square meter. "The state of the art of airborne laser scanning (ALS) used along with LIDAR (light detection and ranging) is known by the speed of gathering data, high accuracy and high resolution. This method brought a real revolution in the field of a topographical survey" (Mongus et al., 2013, 245).

As with any project, the input data are extremely important and must be accurate to achieve the highest quality and best results possible. The basis of research for all projects connected with terraced areas involves inventorying terraced areas in the field. There is a common method that is used but has some drawbacks that can significantly reduce the quality of the data needed for studying terraced landscapes. The new method described here addresses these drawbacks and offers a new workflow for reliably detecting terraced areas. What is interesting are the quantitative differences of results when following the new and the old methods and the scope of difference between them.

METHODOLOGY

The University of Ljubljana's Faculty of Architecture was a project partner in the Slovenian research project Terraced Landscapes in Slovenia as Cultural Values between 2011 and 2014. The survey included the entire territory of the country, or 20,273 km², consisting of 2,716 cadastral units and 6,031 settlements. One of the university team's accomplishments was a comprehensive GIS analysis of the selected pilot areas.

After 2014, the Faculty of Architecture continued its own research, based on the conclusion that the photo interpretation model works in combination with a field survey to convey reliable results, but has one major weakness. The procedure offers no data making it possible to recognize abandoned terraced areas. Generating accurate results requires a great deal of time and labor. The goal was to improve on the existing method for defining terraced areas, which will offer improved accuracy, less fieldwork, and a shorter timeframe for acquiring a greater amount of data.

Among the nine natural landscape type in Slovenia, we searched for suitable areas that contain terraced areas. Among a number of candidates for each natural landscape type, the suitable pilot areas in the form of settlements were selected for analysis (Figure 2).

Definitions

Definition of a terrace

A terrace is a natural or artificial flat or slightly inclined flat surface cut into a slope with a constant incline. "A cultivated agricultural terrace is a more or less flat surface that people carved into a steep slope to obtain arable land or increase its extent, aid or intensify agricultural production, alleviate soil erosion, increase soil moisture, and in some cases make gravitational irrigation possible. A terrace is composed of two basic elements: the terrace surface and terrace slope. The width of the terrace surface depends on the slope inclination, crops grown, and land cultivation" (Ažman Momirski, 2008). Instead of a terrace slope, the soil can be also held back with a wall.

Definition of a terraced area

The terraced areas in this context are cultural terraces intended for agricultural production. Terraced areas may also be used for building purposes or be part of road other transport networks, anti-erosion measures, various infrastructure purposes, or a combination of multiple purposes. The terraced areas are landscapes in which a distinctive uniform pattern of two or more terrace surfaces are present. The terrace surfaces are divided by a slope or wall. Terraced areas can be comprised of active or inactive terraces, or a combination of both, and have a clear boundary.

Defining the boundary of a terraced area

The terraced areas on a detailed 3D grayscale representation of the surface are not difficult to recognize. The difficult part is when the boundaries of the terraces must actually be drawn and the borders must be defined. The flat terrace surfaces and the slopes or walls of the terraces follow the terrain contours. Each terrace has a lower and an upper boundary that follows the terrain contours. The terraced area has two additional borders at the narrow ends of the terrace that connect the ends of the upper and lower border of the terrace.

Defining the highest point of the terraced area

The first task is to define the general direction of the terrain with the elevation extremes of the terrain. The first terrace at the top starts with the beginning of the flat

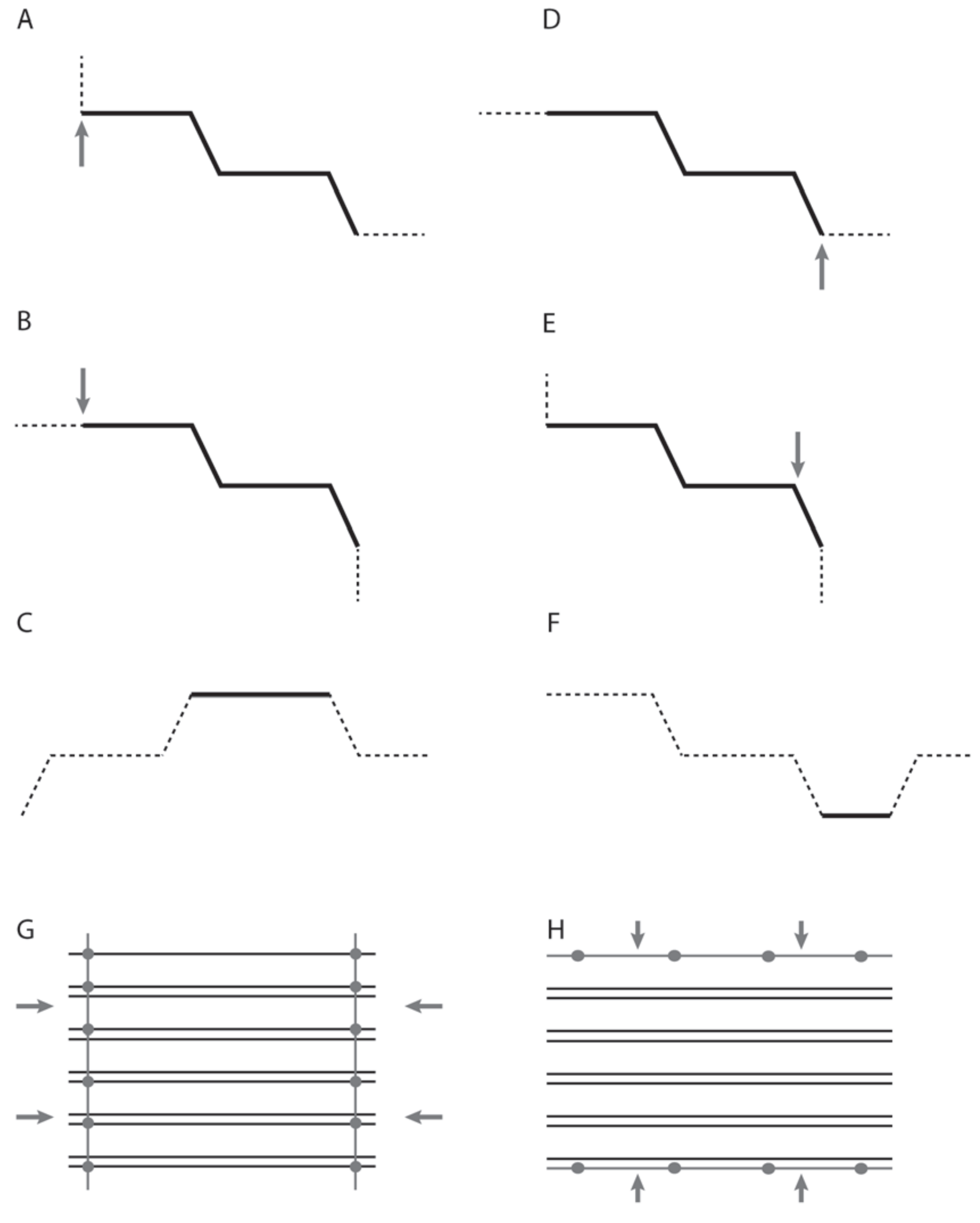


Figure 3: Schematic drawings determining the borders of a terraced area. A) Start of the boundary of the terraced area when the terrain rises above the terraces, B) Defining the boundary when the terrain is flat at the top, C) Situation when everything around the top is terraced landscape, D) Defining boundary at the bottom when the terrain becomes flat, E) Defining bottom boundary when the terrain recedes beyond the terraced area, F) Everything above the bottom is terraced landscape, G) Finding the points that determine the boundaries left and right, H) Defining the top and bottom boundaries.

part of the terrace. There are generally three possible scenarios. If one takes a terraced area as a whole, it is necessary to determine what happens beyond the highest point of the area. The terrain may continue upwards, the terrain may become flat, or the terrain may descend in the opposite direction. If the terrain continues upwards, which is the most common situation, the start of the terraced area is at the base of the incline. With all the other situations, the land-use must be taken into account to determine the bounds of the terraced area. If terrain descends and there are no terraces on the downward slope and the entire flat of the area is agriculturally cultivated, the boundary is on the threshold between the flat surface and downward slope. If the flat part is not completely cultivated, the boundary is at the end of a cultivated area. To determine the bottom edge of the terraced area, the procedure is similar. If the terrain ends in a flat area (which is most common), the end of the terraced area is at the base of the last terrace slope or wall. If the terrain continues downwards but there is no more visible terracing, the terrace ends at the end of the flat part of the terrace just before it continues downward.

In some cases, a field survey is still necessary, but it is not always the most reliable. Sometimes, especially with dynamic terrain with low inclinations, lush foliage, and stone piles between the plots, appearances can be deceiving. The photo interpretation method is still a reliable way of determining terraced areas, but it is time-consuming, difficult in bad weather conditions, and even dangerous in steep rocky terrain.

Digital data sources

DOF050 orthophoto images are the primary underlay and are a collection of georeferenced images available through the Surveying and Mapping Authority of the Republic of Slovenia (Digitalni ortofoto posnetki 5×5m, 2011–2015**)**. The raster data resolution cell size is 0.5 m. For some areas, a greater resolution was available with a cell size of 0.25 m, but this was not used because of the sheer scope of the data. The raster data is geometrically ortho-corrected so that the scale is uniform throughout the image and is thus like a map. The layer is the base layer for making a base photointerpretation map of terraced areas.

The digital elevation model (DEM5) has a resolution of 5 m and a height accuracy of 1 m in open areas and 3 m on overgrown and mountain areas. The layer cannot be directly used for recognizing terraced areas because is too coarse. The point cloud is too dispersed and the terraced features are too small to be recognized in the layer. The planar accuracy is too unrefined and too interpolated. The terrace dimensions are below the physical level of recognition. DEM5 is an important analytical tool for representing and interpreting the elevation maps of larger landscapes of cadastral units, settlements, and other localities (spatial administrative units) with a scale larger than 1:5,000.

Land use is a digital database available through a webpage (Internet 2) of the Ministry of Agriculture, Forestry, and Food and is a detailed database with frequent updates, also offering a comprehensive look at changes in land use through time. The data format is polygons and these are photo-interpreted through a comprehensive set of rules over the natural boundaries as seen on the orthophoto images and in fieldwork. The land use is regularly updated and has a well-defined key (Interpretacijski ključ, 2013) and structured attributes (Podatki o dejanski rabi tal, 2015).

The data for current land use are defined by:

- A computer-supported photo interpretation method for orthophoto images;
- The use of other records, which allow significant improvement of current land-use data;
- Field surveys and measurements.

The smallest area considered for uniform agricultural land use is 1,000 m^2. Exceptions include vineyards (500 m^2), olive groves (500 m^2), plant nurseries (500 m^2), other permanent groves (500 m^2), other permanent crops (500 m^2), greenhouses (250 m^2), agricultural land located within the built-up area, and similar land and forest areas larger than 5,000 m^2. The polygons may be even smaller, especially if they are part of the Registers of Agricultural Holdings. Land-use polygons are defined by natural boundaries as seen on orthophoto images or on the basis of fieldwork where available or required. The types of land use are defined in the Regulation of Current Land-Use Records of Agricultural and Woodland Plots. From the "arable land and gardens," "permanent crops," and "grassland," we eliminated all plots that fit under "build-up land" or "water" and are larger than 25 m^2. We also eliminated all plots larger than 100 m^2 that fit under "other agricultural land," "forest," and "other non-agricultural land," as well as all transport infrastructure wider than 2 m, unless defined differently in a detailed instructions guide for defining each type of land use.

The "permanent crops on arable land" (ID no. 1180), "other permanent groves" (ID no. 1240), "plantations of forest trees" (ID no. 1420), and "forest tree nurseries" (ID no. 1212) are more difficult to determine on the basis of orthophoto interpretation, and this is why we used the data from the Registers of Agricultural Holdings and the field survey. In the case of mixed land use with "permanent groves" (e.g., olives and fruit trees) the prevailing land use is set (Interpretation key, 2013).

It was seen that the land-use layer in combination with other data is an outstanding tool for defining the boundaries of active terraced areas. Unfortunately, abandoned terraced areas are indiscernible with this method, but they can be anticipated with a comparison between current and historical land-use analysis.

The Franciscan Cadaster, (Sheets AS-176, L/L175, AS-176, L/L45, AS-176, N/N214, AS-176, N/N93, AS-177, M/F/M476, AS-179, G/FJ/G131, AS-179, G/FJ/G64, AST-

179, I/FJ/I43) produced under Emperor Francis I, were used to analyze the historical land use of the pilot areas. The historical land use is important for defining and verifying potential locations of abandoned terraces. The accuracy of the historical data source is very good, but there are no data about the relief. The terraced areas are usually very well recognizable because of geometrization of the landscape and subsequent parcellation. The archive material of the Franciscan Cadaster is comprised of paper prints measuring 655 mm by 525 mm at a scale of 1:2,880. Most of them are digitized, but because of their age, various storage conditions, and various kinds of paper, they have stretched and contracted over time, becoming deformed. The separate sheets of paper were assembled into a larger mosaic of the cadastral units they represent, georeferenced, and then cropped to the size of the pilot areas.

The historical land-use correlation key is an adjustment and improvement of the table made by Franci Petek for the correlation between historical and current land use (Petek, 2008, 73).

LIDAR is point cloud data achieved through aerial laser scanning, and it has been provided for public use in raw and other refined formats, each intended for a specific use (Projekt 'Lasersko skeniranje in aerofotografiranje 2011' za določitev poplavnih območij, 2011). One of the most important end results of this kind of scanning is a DEM of the landscape in high resolution, which even surpasses the photogrammetrically derived DEM (Podobnikar, 2008). For the analysis, LIDAR DEM data were used, based on interpolated OTR points, transcribed in a grid measuring 1 m by 1 m available in an ASCII file. The LIDAR DTM (digital terrain model) used is twenty-five times more accurate than the DEM5 used in a previous analysis. The main advantage of LIDAR technology is that radar signals pass through the foliage and bounce off the ground. In this way, the overgrown terraced terrain features become visible. This is one of the most significant advancements in anthropological landscape study in recent times.

Workflow

This workflow was processed using ESRI ArcMap 10 software, but it can be recreated using any other available GIS analysis software tools. For the chosen pilot area, we prepared a digital file database consisting of available data. We started with an orthophoto image for reference and clipped it to the pilot area boundary. The orthophoto is overlaid with current land use, which is also clipped down to the particular boundary of interest. From the complete land-use layer, we removed all the attributes that correspond to "built up land" (ID code 3000) and "water" (ID code 7000). We also eliminated all plots that fit under "other agricultural land," "forest," and "other non-agricultural land", as well as all land use for which the numbers are greater than 1400 (except for 1600, which designates unused agricultural land). With this procedure, we obtained areas of disjointed clumps of polygons with a variety of land uses. A version was saved in a separate file for further reference. The copy of the modified land-use data layer was then merged to form a unified boundary of functioning agricultural land that contains a smaller domain of active terraces.

The next step was the use of LIDAR DEM data with a cell density of 1 m. This level of accuracy in the DEM is detailed enough that, when put through 3D Analyst tools in the Raster Surface subset and the slope analysis tool is used, the geometric pattern of terraces emerges. It is an essential interpretational tool that can accurately define the boundaries of terraced areas. When the interpreted layer with borders of terraces is clipped with the modified land-use layer from the previous step, a very accurate final layer of boundaries of active terraces is derived. The remainder of visible terraced pattern are overgrown inactive terraced surfaces. The final results of active terraces are checked against the orthophoto image to eliminate any possible lapse in data. The abandoned terrace layer is matched against the historic land-use layer derived from the Franciscan Cadaster.

Terrain analysis requires its own set of analysis. The first terrain analysis is the terrain aspect. The basis for this is 3D terrain elevation data in the form of point cloud coordinates, DEM, or LIDAR DEM data sets. For this we used the Raster Surface Aspect tool from the 3D Analyst tool subset. This tool requires an input raster and identifies the downslope direction of the maximum rate of change in value from each cell to its neighbors. It can be thought of as the slope direction. The values of each cell in the output raster indicate the compass direction that the surface faces at that location. It is measured clockwise in degrees from 0 (due north) to 360 (again due north), coming full circle. Flat areas having no downslope direction are given a value of –1 (ESRI Knowledge Base). It is an essential tool for defining terrain orientation, which is essential for various purposes such as agricultural production, biodiversity, environmental impact on building placement, and many others. The methodology for the particular analysis is a division into eight classes: north, northeast, east, southeast, south, southwest, west, and northwest. In addition to the four basic orientations, four more were added for a more meaningful result.

The most important analysis in this study is a terrain slope analysis. Slope represents the rate of change of elevation for each DEM cell. It is the first derivative of a DEM. For each cell, the Slope tool calculates the maximum rate of change in value from that cell to its neighbors. Basically, the maximum change in elevation over the distance between the cell and its eight neighbors identifies the steepest downhill descent from the cell.

The methodology developed for detecting flat and steep areas of the terraced landscape is such that the slope is divided into five classes or categories. The inclination can be calculated in degrees or output as per-

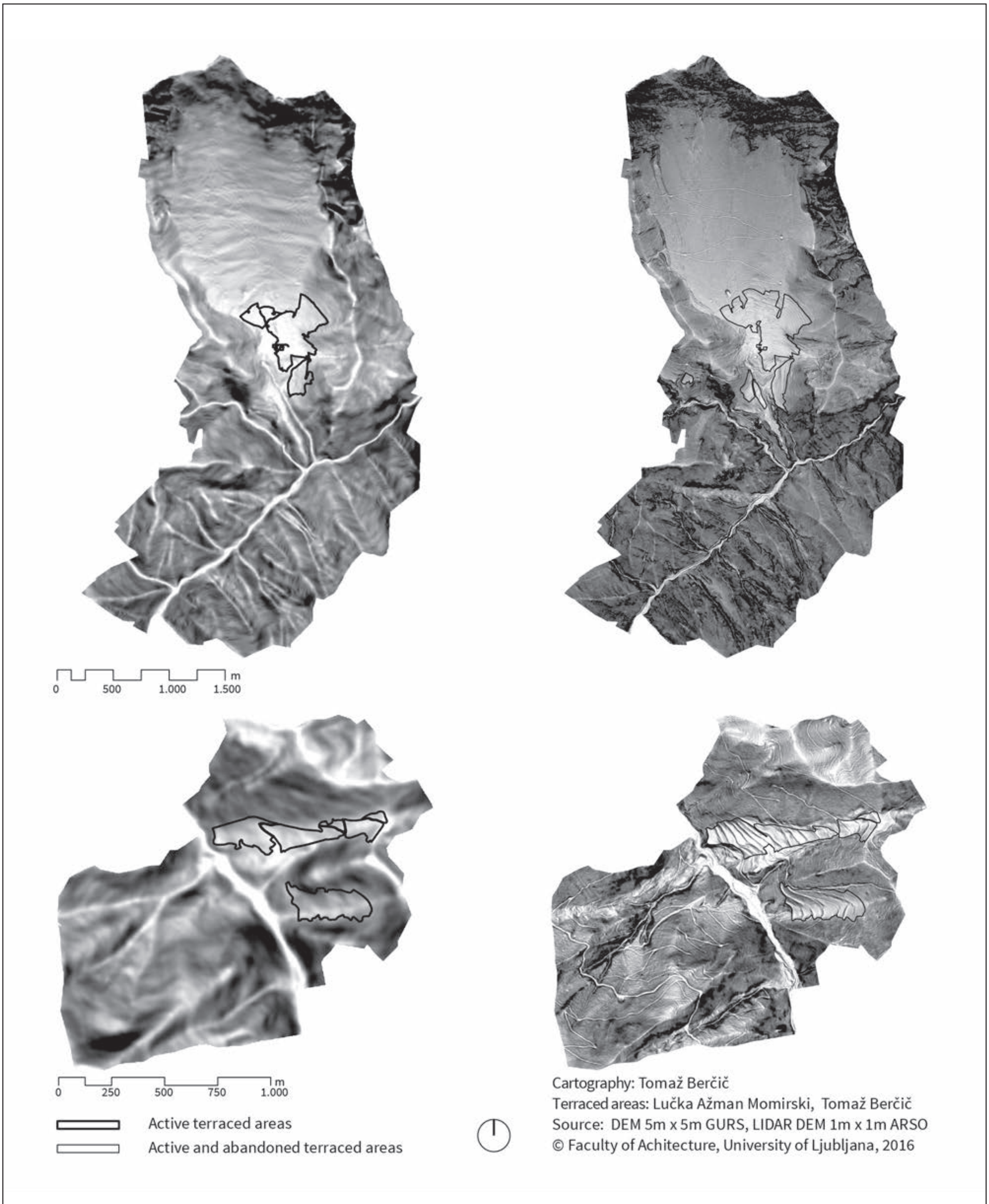


Figure 4: The top left image shows DEM5 slope data with an active terrace overlay for the settlement of Rut. The top right image shows LIDAR data with detected active and abandoned terraced areas for the same pilot area. The bottom left image shows the DEM5 slope data with an active terrace overlay for the settlement of Smoleva. The bottom right image shows LIDAR data with detected active and abandoned terraced areas for the same pilot area.

centage values. The first category ranges from 0 to 15% (0–8.5°), the second from 15 to 30% (8.5–16.7°), the third from 30 to 50% (16.7–26.6°), the fourth from 50 to 70% (26.6–35°), and the fifth is over 70% (35°). By default, the slope appears as a grayscale image. A color-map function can be added to specify a particular color scheme.

RESULTS

The first representative of Slovenian natural landscape types is the Alpine mountains, with the first pilot settlement chosen: Rut in the Bače Gorge. It is part of the Municipality of Tolmin. The settlement of Rut is a remote and poorly accessible village. It has a unique position on the southern side of Slovenian Julian Alps. Its area is the largest of the selected case studies, at 1,017 hectares, mainly on account of the mountainous terrain in the northern part. It is also the second-smallest by population, with a population of only forty-two (SURS, 2015). The lowest elevation in the settlement is 371 m and the highest is 1,967 m. The part of the village where the only cluster of the buildings is located is at 676 m. Around the cluster towards the north, east, and south in a fanlike pattern the terraces are spread out, with an average elevation of 695 m. The orientation of the settlement at first glance is predominantly southern, which the aspect analysis confirms. Southern orientations encompass more than half of the settlement's territory (SE 15%, S 28%, and SW 14%, plus NW 7%, N 4%, and NE 9%.) The impassable terrain to the north and on the edges of the settlement is represented in the slope analysis where terrain with a slope greater than 50% (45 degrees) consists of more than 80% of the area of the settlement. Gentle slopes are few (altogether 20%; first category 2%, second category 4%, and third category 13%). According to LIDAR analysis, terraced areas encompass thirty-six hectares, which is 5% of the settlement area. According to the old method of analysis carried out with DEM5, the terraced areas were fewer, or twenty-six hectares. The difference in values is the difference between active and abandoned terraced areas. The elevation extents of the terraced areas are 598 m at the lowest and 786 m at the highest. The orientation of the terraced areas is even more revealing. A northern orientation does not exist, and the southern orientations reach 81% of the total terraced areas (SE 17%, S 31%, and SW 33%). The slope analysis of the terraced areas shows that the majority of terraced areas are in the second category (51%; plus first category 15% and third 27%).

The settlement of Smoleva is representative of the Alpine hills. The settlement boundary is contained within the cadastral unit of Martinj Vrh in the Municipality of Železniki. The settlement consists of two oppositely oriented hillsides with Lower Smoleva Creek (Sln. *Prednja Smoleva*) separating them in the middle. For the settlement and agricultural land, the incline below Špik Hill (882 m) with a favorable orientation is utilized. The opposite-facing mountainside below Mount Vancovec (1,085 m) is entirely forested. The settlement area is 183 hectares and has a population of fifty-seven. The lowest elevation of the settlement is 484 m, and the highest is 1,080 m. The average elevation of the settlement is 719 m. The settlement has two clusters of buildings: one is in the valley, and the other is on the hill. Considering that the settlement consists of two opposing inclines, the orientation aspect is evenly distributed (NE 17%, E 12%, SE 10%, S 10%, SW 16%, W 8%, and NW 11%). Interestingly, the values of the average slope categories are the same as in the settlement of Rut, discussed above. However, the slope values of the terraced areas in Smoleva differ greatly. According to the LIDAR data, terraced areas comprise twelve hectares, which is 7% of the settlement's area. There is no difference between the LIDAR and DEM5 data. No abandoned terraces were detected. All terraced areas are active and in use. The minimum elevation of the terraced areas is 521 m, the maximum 779 m, and the average 633 m. There are no terraced areas oriented towards the north, northeast, east, and southeast. The majority of terraces are oriented toward the southwest (63%; others orientations are S 9%, W 20%, and NW 7%). Based on the slope of the terraced areas, they are all evenly distributed among the categories; the middle three slope categories contain 80% of all the terraced areas.

Rodine is a small settlement in the Municipality of Žirovnica. It is surrounded by three large urban areas in the Upper Carniola region: Bled, Žirovnica, and Begunje. Rodine belongs to natural landscape type of Alpine plains. They lie on the southern foot of Mount Begunščica and, like all Alpine localities, they have a distinct south and southwest orientation. The settlement size is 180 hectares and it has a population of 116 (SURS, 2015). The minimum elevation is 521 m, and the highest is 960 m, averaging around 960 m. The buildings are clustered in the western part of the settlement. The settlement landscape faces south (16%), southwest (42%), and west (20%). The slopes of the settlement, as part of the Alpine plains, are on the low side (first category 44%, second category 20%, third category 15%, fourth category 11%, and fifth category 10%). Eighty percent of the slopes fall into the first three categories under the 50% limit. There are twenty-four hectares of terraced landscape, which corresponds to 13% of the settlement area. The lowest elevation for the terraces is 533 m, and the highest is 590 m. The average elevation is 522 m. The terraces oriented toward the north, northeast, east, and southeast are insignificant in size. Sixty-nine percent of them face southwest, 17% south, and 11% due west. The terraced areas lie in the flat part of the settlement.

The settlement of Velika Slevica lies in the Municipality of Velike Lašče and is part of the Dinaric valleys and corrosion plains, according to the natural landscape

types of Slovenia. It is located on a small mound with a predominantly southern orientation. The size of the settlement is 113 hectares, the lowest elevation is 522 m, the highest elevation is 655 m, and the average elevation is 585 m. The village has a population of fifty-seven (SURS, 2015). Based on the shape of the terrain, aspect

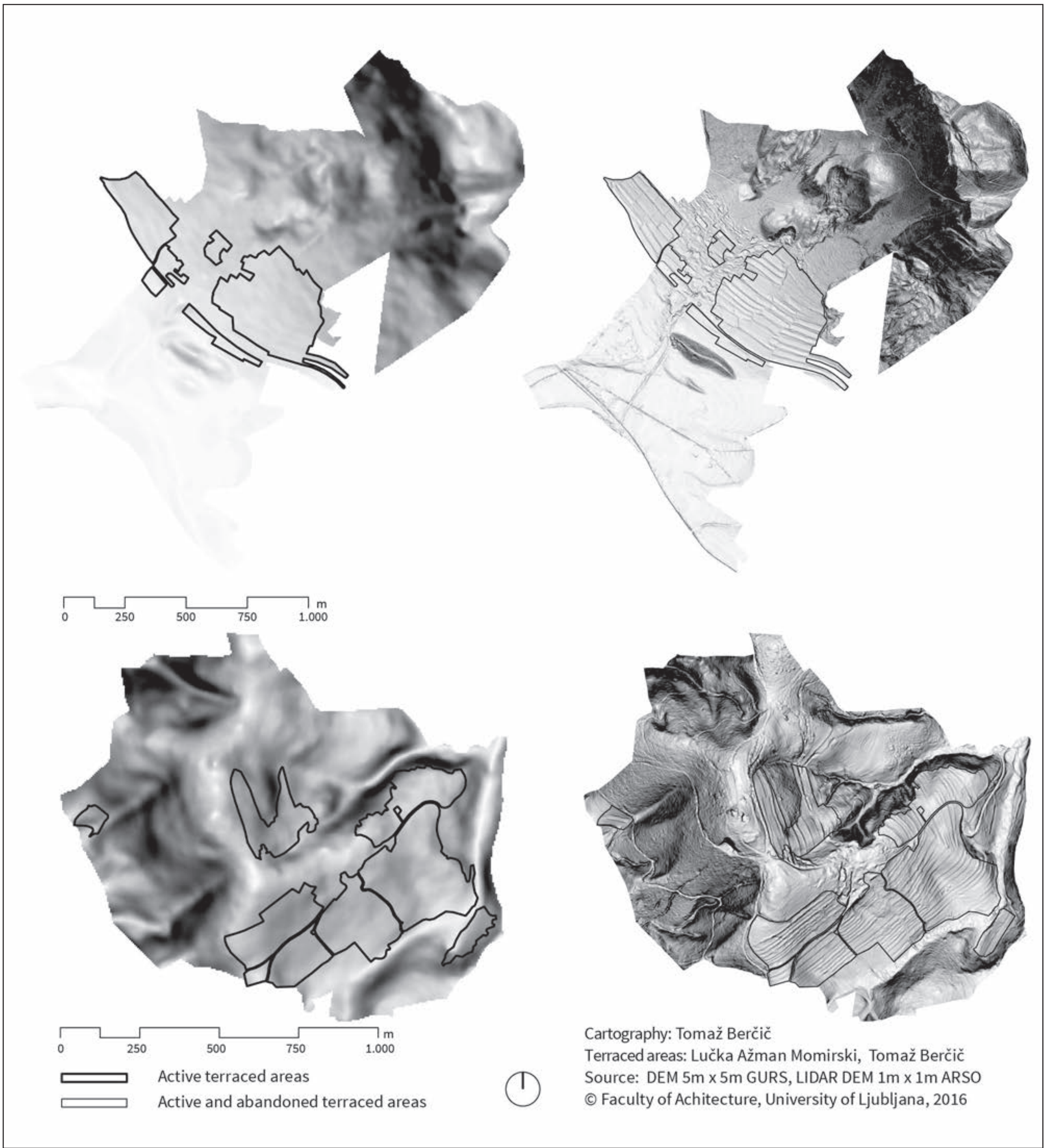


Figure 5: The top left image shows the DEM5 slope data with the active terrace overlay for the settlement of Rodine. The top right image shows LIDAR data with detected active and abandoned terraced areas for the same pilot area. The bottom left image shows the DEM5 slope data with the active terrace overlay for the settlement of Velika Slevica. The bottom right image shows LIDAR data with detected active and abandoned terraced areas for the same pilot area.

analysis shows equally distributed terrain orientations with an emphasis on regions facing east and southeast (other terrain aspect values are N 11%, NE 8%, E 17%, SE 22%, S 9%, SW 10%, W 13%, and NW 10%). Slope analysis shows that the inclination is predominantly in the first three categories (first category 26%, second category 36%, third category 29%, fourth category 8%, fifth category 1%). The terraced area covers twenty-seven hectares of the settlement area, or 1% less than a quarter of the entire settlement area. The lowest elevation of the terraced areas is 530 m, the highest is 643 m, and the average is 580 m. There is no difference be-

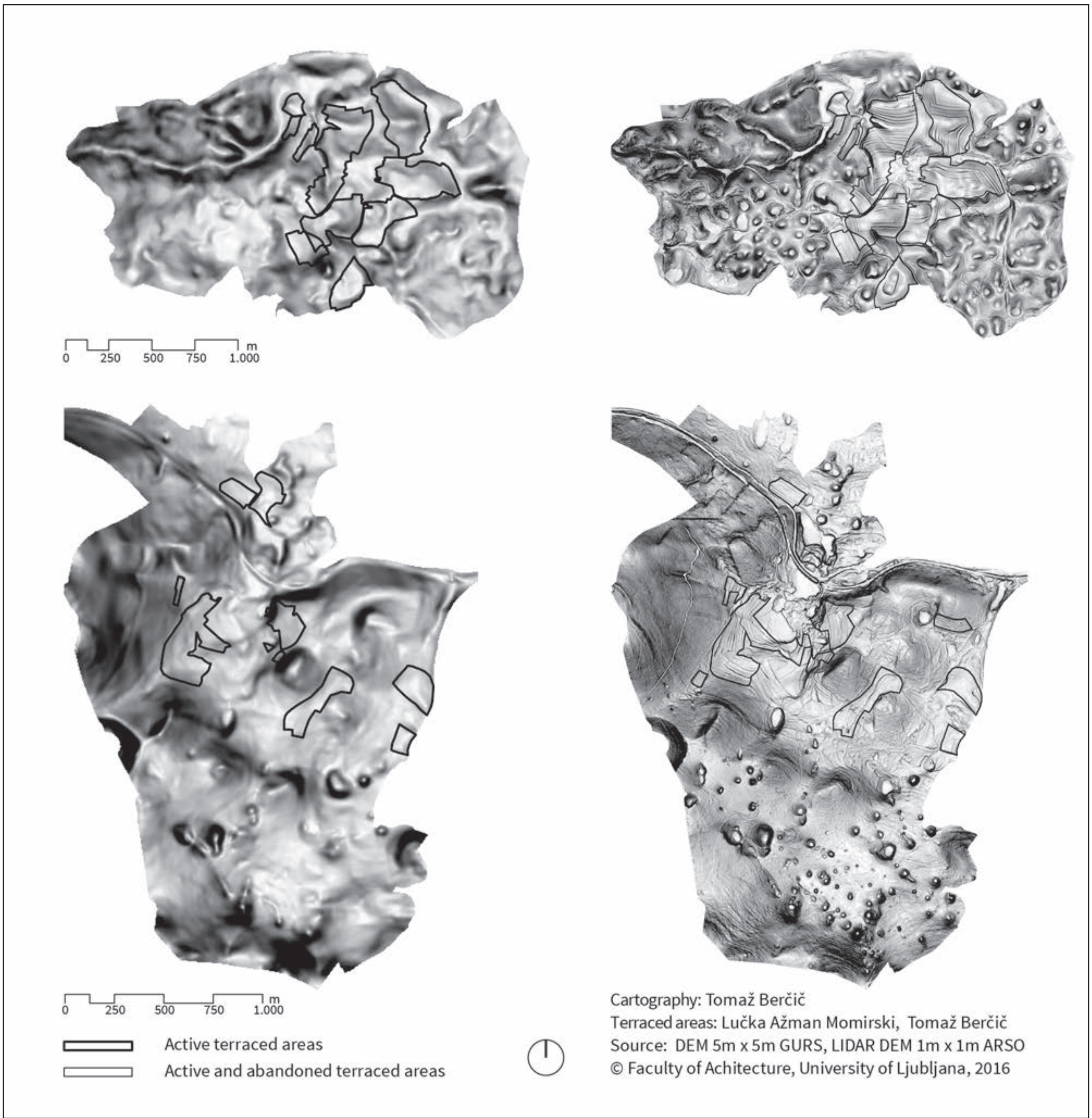


Figure 6: The top left image shows the DEM5 slope data with the active terrace overlay for the settlement of Dečja Vas. The top right image shows LIDAR data with detected active and abandoned terraced areas for the same pilot area. The bottom left image shows the DEM5 slope data with the active terrace overlay for the settlement of Merče. The bottom right image shows LIDAR data with detected active and abandoned terraced areas for the same pilot area.

tween the LIDAR and DEM5 data, which means that no difference was detected between active and abandoned terraces. The terrace orientation follows the general orientation of the entire settlement (N 4%, NE 9%, E 28%,

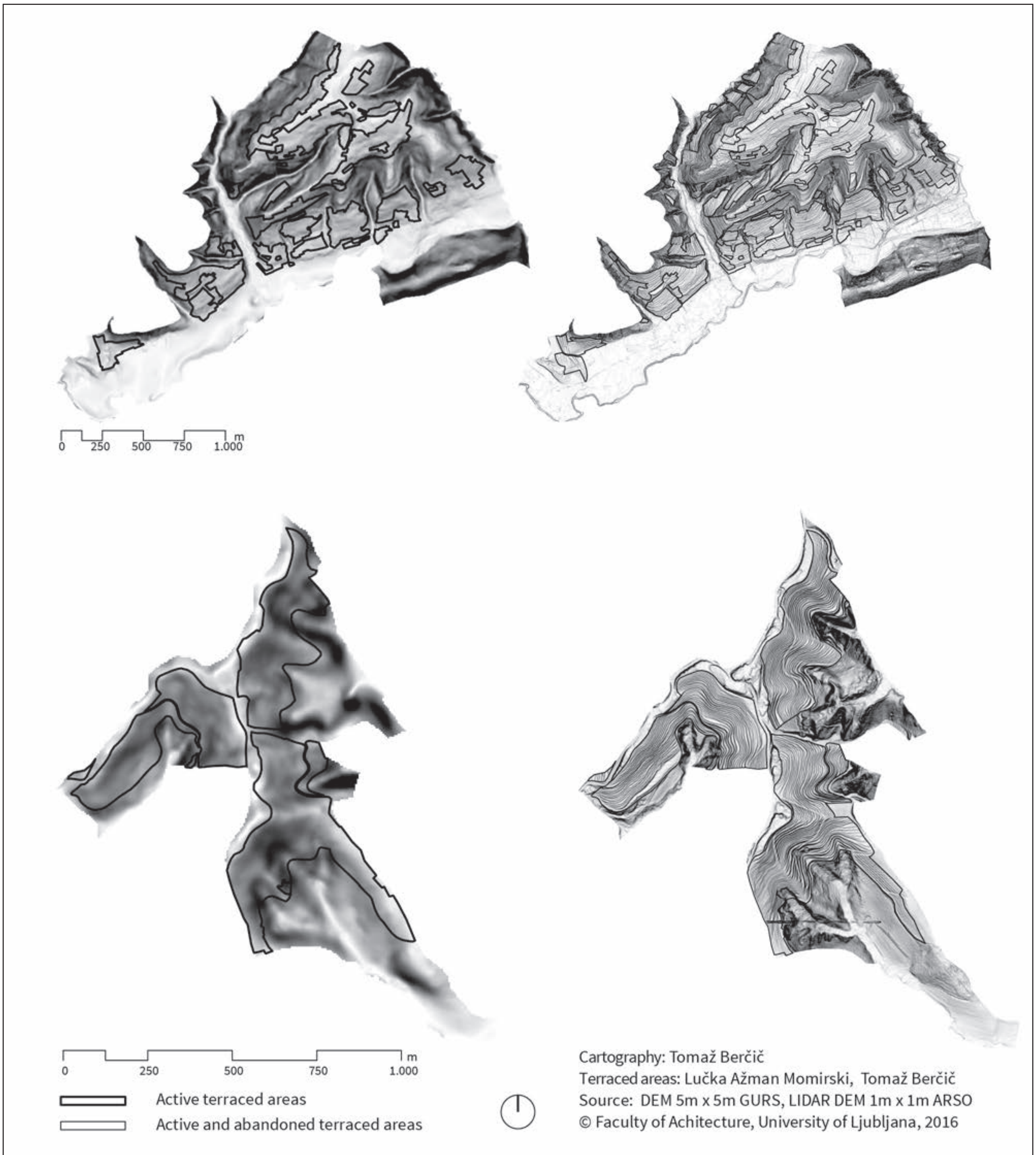


Figure 7: The top left image shows the DEM5 slope data with the active terrace overlay for the settlement of Krkavče. The top right image shows LIDAR data with detected active and abandoned terraced areas for the same pilot area. The bottom left image shows the DEM5 slope data with the active terrace overlay for the settlement of Jeruzalem. The bottom right image shows LIDAR data with detected active and abandoned terraced areas for the same pilot area.

SE 43%, S 10%, SW 1%, W 1%, and NW 4%) with an emphasis on the southeast and east regions. The slope analysis of the terraced areas is predominantly in the first two categories (first category 38%, second category 49%, third category 12%, fourth category 1%, and fifth category 0%).

The village of Dečja Vas is part of the Dinaric plateaus according to the natural landscape types of Slo-

TABLE 1	NATURAL LANDSCAPE TYPE	POPULATION 2015	SETTLEMENT AREA / PERSON ha	TERRACES / PERSON ha	MIN ELEV. m.a.s.l.	MAX ELEV. m.a.s.l.	AVERAGE ELEV. m.a.s.l.	TA ELEV. MIN m.a.s.l.	TA ELEV. MAX m.a.s.l.	TA ELEV. AVERAGE m.a.s.l.
RUT	Alpine mountains	42	24.22	0.63	371.55	1967	854	598	786	695
SMOLEVA	Alpine hills	57	3.21	0.22	483.95	1080	719	521	779	633
RODINE	Alpine plaines	116	1.56	0.2	521.25	960	641	533	590	552
VELIKA SLEVICA	Dinaric valleys and corrosion plaines	57	1.99	0.47	522.16	655	585	530	643	580
DEČJA VAS	Dinaric plateaus	65	4.7	0.77	287.89	475	353	307	382	340
MERČE	Mediterranean plateaus	108	3.63	0.22	341.76	575	424	362	440	403
KRKAVČE	Mediterranean low hills	304	2.13	0.45	14.95	275	114	23	268	142
JERUZALEM	Pannonian low hills	33	1.81	0.85	232.98	345	292	264	343	309

TABLE 2	ASPECT	N	NE	E	SE	S	SW	W	NW	SLOPE	0 - 15%	15% - 30%	30% - 50%	50% - 70%	>70 %
RUT		4%	10%	9%	15%	28%	14%	10%	7%		2%	4%	13%	27%	53%
RUT TA		0%	0%	5%	17%	31%	33%	14%	0%		15%	51%	27%	5%	1%
SMOLEVA		16%	17%	12%	10%	10%	16%	8%	11%		2%	4%	13%	28%	53%
SMOLEVA TA		0%	0%	0%	0%	9%	63%	20%	7%		5%	17%	36%	25%	17%
RODINE		4%	4%	3%	4%	16%	42%	20%	6%		44%	20%	15%	11%	10%
RODINE TA		0%	0%	0%	1%	17%	69%	11%	1%		67%	29%	3%	0%	0%
VELIKA SLEVICA		11%	8%	17%	22%	9%	10%	13%	10%		26%	36%	29%	8%	1%
VELIKA SLEVICA TA		4%	9%	28%	43%	10%	1%	1%	4%		38%	49%	12%	1%	0%
DEČJA VAS		12%	13%	15%	16%	16%	11%	8%	9%		37%	38%	21%	4%	1%
DEČJA VAS TA		12%	11%	14%	12%	15%	16%	9%	11%		58%	34%	5%	2%	1%
MERČE		16%	19%	23%	15%	7%	5%	6%	9%		45%	34%	17%	3%	1%
MERČE TA		11%	15%	25%	16%	7%	6%	10%	10%		69%	22%	8%	2%	0%
KRKAVČE		9%	7%	9%	19%	18%	12%	11%	14%		40%	17%	17%	15%	11%
KRKAVČE TA		3%	3%	7%	27%	28%	10%	10%	11%		41%	26%	16%	10%	7%
JERUZALEM		5%	11%	20%	25%	16%	15%	5%	4%		24%	30%	27%	13%	5%
JERUZALEM TA		2%	7%	24%	34%	14%	12%	5%	2%		15%	35%	33%	13%	3%

TABLE 3	AREA ha	TA DMV5 ha	TA DMV5 %	TA LIDAR ha	TA LIDAR %	CHANGE ha	CHANGE %
RUT	1017	26	3	36	4	10	- 27
SMOLEVA	183	12	7	12	7	0	0
RODINE	181	23	13	24	13	1	- 5
VELIKA SLEVICA	114	27	24	27	24	0	0
DEČJA VAS	306	50	16	51	17	1	- 3
MERČE	392	23	6	26	7	3	- 12
KRKAVČE	647	135	21	167	26	32	- 19
JERUZALEM	60	28	47	26	44	-2	6

* **TA** - terraced areas * **ELEV** - elevation

Figure 8: Statistics for the pilot areas.

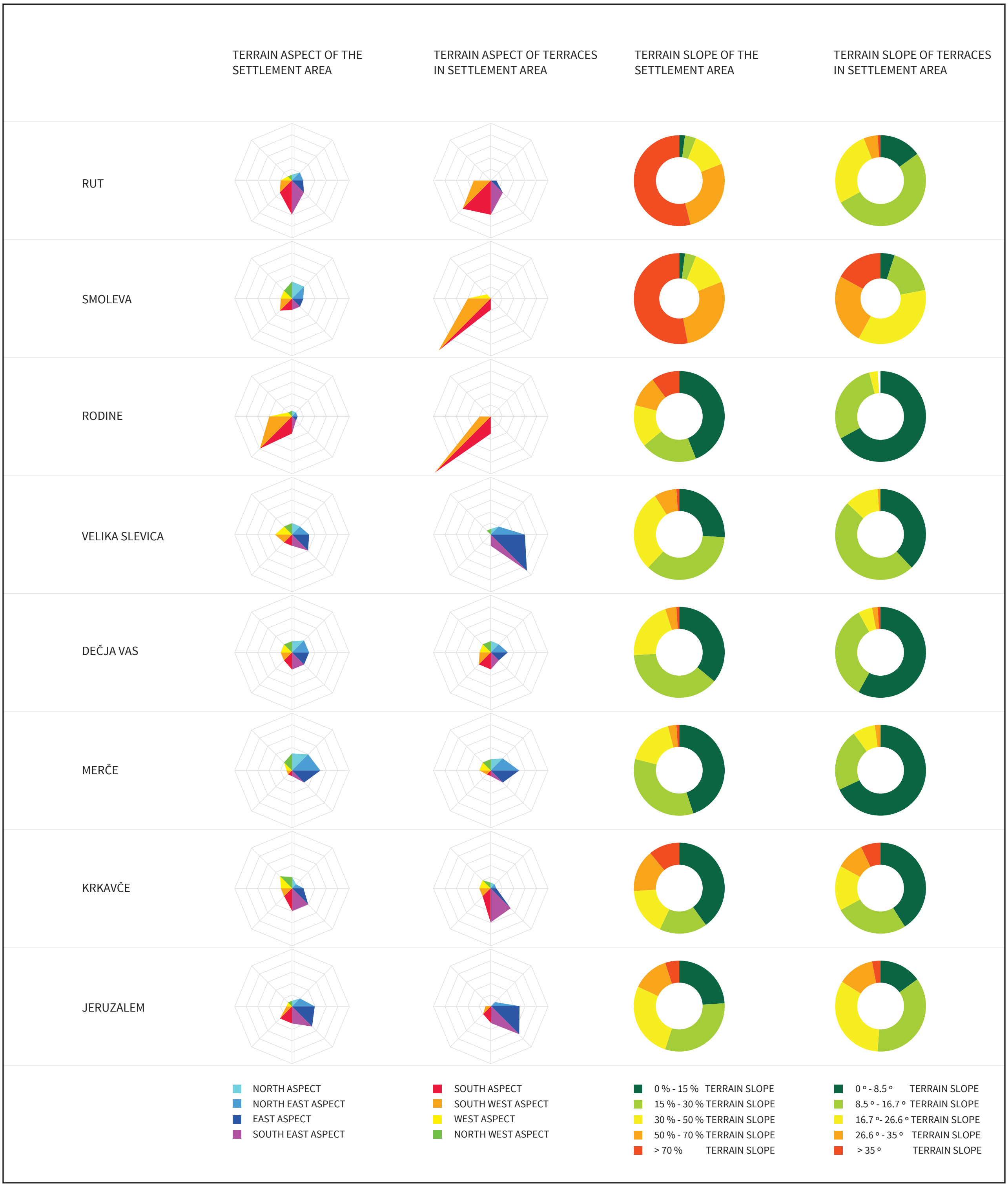


Figure 9: Graphic representation of the statistics of terrain aspect and terrain slope for the settlements and pilot areas.

venia. It is part of the cadastral unit of Ponikve in the Municipality of Trebnje. The settlement area is 306 hectares and has a population of sixty-five (SURS, 2015). The lowest elevation in the settlement is 288 m, the

highest is 475 m, and the average is 353 m. The aspect analysis of the terrain of the settlement is mixed (N 12%, NE 13%, E 15%, SE 16%, S 16%, SW 11%, W 8%, and NW 9%) and the slopes are as follows: first category 37%, second category 38%, third category 21%, fourth category 4%, and fifth category 1%. According to the LIDAR data analysis, terraces cover fifty-one hectares, which corresponds to 17% of the settlement's area. The terraced elevation extremes lie at a minimum of 307 m, a maximum of 382 m, and an average of 340 m. Active terraces consist of fifty hectares, which correspond to 16% of the territory. The difference between the active and abandoned terraces is only one hectare. The aspect analysis of the terraced areas is mixed (N 12%, NE 11%, E 14%, SE 12%, S 15%, SW 16%, W 9%, and NW 11%). The slope analysis offers no surprises, considering that the low-lying terrain is mostly in the first two categories (first category 58%, second category 34%, third category 5%, fourth category 2%, and fifth category 1%).

The settlement of Merče in the Municipality of Sežana is part of the Mediterranean plateaus. The area of the settlement is 392 hectares and it has a population of 108 (SURS, 2015). The lowest elevation in the territory is 342 m, the highest is 575 m, and the average is 424 m. The aspect analysis of the entire settlement is mixed (N 16%, NE 19%, E 23%, SE 15%, S 7%, SW 5%, W 6%, and NW 9%) and the slopes are as follows: first category 45%, second category 34%, third category 17%, fourth category 3%, and fifth category 1%. There is twenty-six hectares of terraced landscape in the settlement, which corresponds to 7% of the territory. Because of the specific terrain configuration and Karst landscape, the terraces are extremely difficult to read both in the LIDAR model and in the field. The lowest elevation of the terraced area is 362 m, the highest is 439 m, and the average is 403 m. According to DEM5 data analysis, there are twenty-three hectares of active terraced areas, which corresponds to 6% of the area of the settlement. The aspect analysis of the terraced areas is mixed (N 11%, NE 15%, E 25%, SE 16%, S 7%, SW 6%, W 10%, NW 10%) and the slope is as follows: first category 69%, second category 22%, third category 8%, and fourth category 2%.

The settlement of Krkavče is part of the Mediterranean low hills and has a population of 304. The lowest elevation in the settlement is 15 m, the highest 275 m, and the average 114 m. The orientation of the territory is mixed (N 9%, NE 7%, E 9%, SE 19%, S 18%, SW 12%, W 11%, and NW 14%) and the slopes are as follows: first category 40%, second category 17%, third category 17%, fourth category 15%, and fifth category 11%. Terraced areas cover one-quarter (167 hectares) of the settlement's land. The lowest elevation of the terraces is 23 m, the highest is 268 m, and the average 142 m. The aspect of the terraced areas is mixed (N 3%, NE 3%, E 7%, SE 27%, S 28%, SW 10%, W 10%, and NW 11%) and the slopes are as follows: first category 41%, second category 26%, third category 16%, fourth category 10%, and fifth category

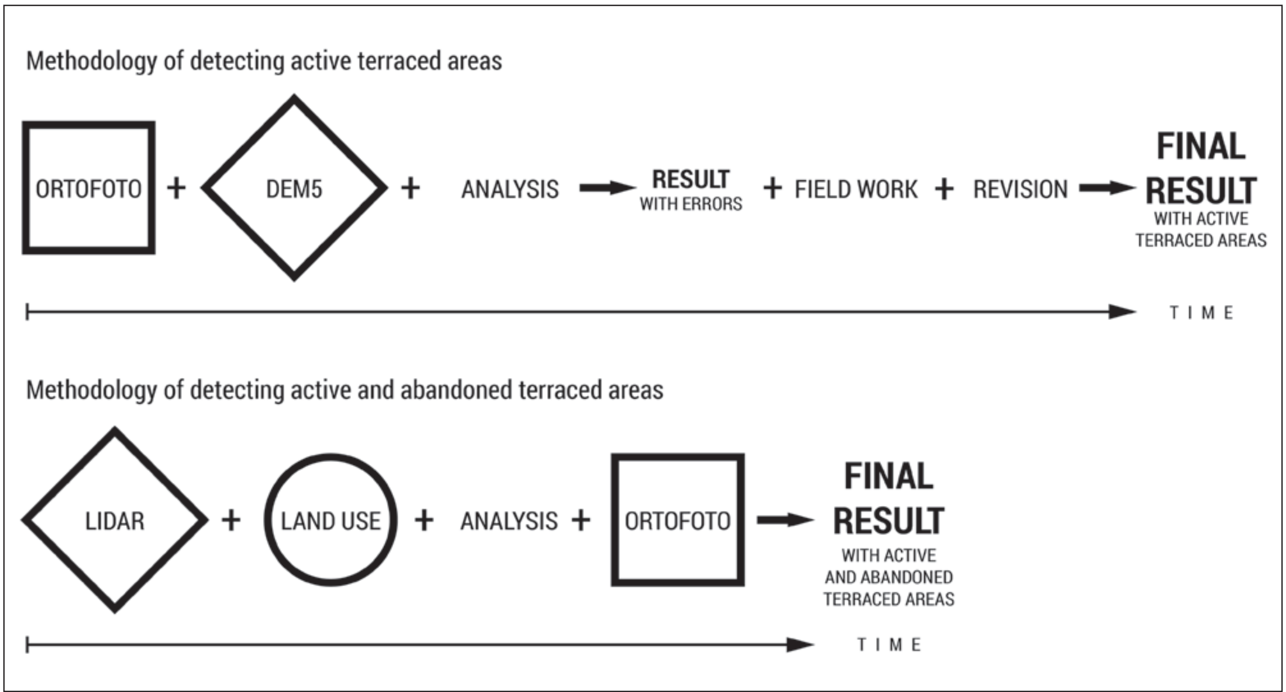


Figure 10: The workflow difference between analysis with and without the detailed LIDAR dataset. The first final result shows only active terraced areas. The second less time-consuming and more precise approach indicates not only active terraces but also abandoned terraced areas.

7%. In this case, there is a significant difference between active and abandoned terraces. According to DMV5 data, there is over 135 hectares of active terraces in more remote and difficult-to-access parts of the settlement. As much as 19% of terraces detected with LIDAR data areas are abandoned, totaling thirty-two hectares.

The settlement of Jeruzalem is part of the cadastral unit of Plešivica in the Municipality of Ljutomer and is part of the Pannonian low hills. The area of the settlement is sixty hectares. The lowest elevation in the settlement is 233 m, the highest 345 m, and the average 292 m. The aspect of the terrain analysis of the entire territory is mixed (N 5%, SE 11%, E 20%, SE 25%, S 16%, SW 15%, W 5%, and SW 4%) and the slopes are as follows: first category 24%, second category 30%, third category 27%, fourth category 13%, and fifth category 5%. Jeruzalem in an extremely terraced settlement, with terraces comprising an astonishing twenty-six hectares, or 44% of the entire settlement area. The lowest elevation of the terraced areas is 264 m, the highest 343 m, and the average 309 m. The method with DEM5 data suggested that terraces cover an even greater area, or 47% of the settlement. However, because of the difficult accessibility of some parts of the terrain in the field, there was no way of determining the exact boundaries of the terraced areas. Again, this is a testament to the value of LIDAR data, without which the definition of the boundary of the terraced areas would be impossible in this case, or at least extremely difficult. The aspect analysis of terraced areas is mixed (N 2%, NE 7%, E 24%, SE 34%, S 14%, SW 12%, W 5%, and NW 2%) and the slopes are as follows: first category 15%, second category 35%, third category 33%, fourth category 13%, and fifth category 3%.

DISCUSSION

This research project has shown that, overall, terraced landscapes are frequent in Slovenian territory. Terraced areas are usually found in small settlements with less population, and this is why they are most frequent where urbanization has not left a permanent footprint. Where the influence of urbanization is more apparent, terraces have succumbed to construction pressure because they are flat and offer a good view. Terraced areas remain where the population is low, the agricultural production on terraces has added value, and the terraces are a significant or main source of people's income.

With the introduction and public availability of LIDAR data for the entire territory of Slovenia, it is now possible to discover the historic underlay of the development of terraced landscapes, especially in remote and difficult-to-access parts of the country. On the basis of historical analysis and without automated statistical geoprocessing, these data can accurately reveal where there were areas suitable for living and agricultural production in the past, which is especially valuable because the positions were based on observation and experience over an extended time period.

The results of the analysis of the pilot areas show that there is no significant difference in extent between active and abandoned terraced areas (ranging between 1% and 3%), and they show that the positions of the terraces have remained more or less the same. The differences emerge on the fringes, on the edge between cultivated areas and natural areas, where access was most difficult. The areas closest to building clusters closer to the center of the settlements remain active and functional. The pilot area settlements of Rodine and Krkavče, where the wish to build up the terraces is the greatest, are under strong urban pressure. In the case of Rodine in the Upper Carniola region, which is close to large urban centers, this pressure is most evident. From the building pattern, there is an easily discernible deliberate change of land use on the terraced areas from agricultural to built-up land. Directly south of the terraces, the remains of a Roman countryside villa (*villa rustica*) were discovered in 1959. The archaeological data show that it was active from the first century AD to the end of the Roman state in the fifth century (Internet 3). Similar increases in built-up land at the expense of terraces were observed in Krkavče because of the warm Mediterranean climate and the proximity to the sea.

Natural landscape types are undeniably a major factor that influences the shape, type, and extent of the terraced areas in a certain landscape. Further terraces are determined by local micro-conditions such as terrain inclination, orientation, soil, elevation, and a combination of these and other aspects.

With certainty, it can be claimed that in the past terraced landscapes were more extensive and that they have been preserved on a large scale where agricultural production is at the forefront of economic development. It is also certain the terraced areas were more extensive in the past in all but one of the pilot areas; however, it can hardly be claimed that terraces' agricultural output has shrunk because of new farming techniques, new cultivars, and new farming equipment. Terraced areas are heavily influenced by weather, erosion, and other climate factors that threaten their existence. It is difficult to say for certain how much of the terraced landscape has disappeared over the centuries.

Paradigm shift

When LIDAR data are processed and run through a slope analysis tool, this offers an unprecedented accurate new interpretation tool for detecting terraced landscapes. The boundaries of terraced areas can now be clearly defined without the help of a field survey, even where the configuration of the terrain made surveys difficult. Because of the nature of LIDAR itself, the segmentation of point cloud data into different classes of foliage, ground, buildings, and so on turns previously hidden earthwork structures (including abandoned ter-

races) into something instantly recognizable. The shift in thinking is that the LIDAR slope analysis layer is more informative for discovering terraces areas than orthophoto images were. This is why LIDAR data are the new paradigm in the search for terraced areas. The orthophoto remains just as important, but nevertheless only a contextual aid.

CONCLUSION

The impact of LIDAR technology on anthropological landscape exploration is immense and not only has importance for research, but also has economic effects. Because of greater precision over older DEM5 models, it offers an interpretation of the terrain without a field survey, significant time savings, quick reaction times for quick terrain checks, and historical terrain monitoring if the measurements are periodically updated. The future offers the possibility of further resolution upgrades for even better results because terraced areas would benefit from even denser point cloud scans, which would represent an additional step forward in landscape analysis. DEM5 data source will remain as historical data, which served its purpose well, but LIDAR has surpassed it and has become the most important platform for landscape research, monitoring, and management, landscape archaeology, and landscape anthropology.

A quantitative comparison between the old and the new methods shows no difference in the three pilot areas, shows only a minor difference in two cases, and reveals major differences in three pilot areas. The quantitative differences in some of the pilot areas are compelling. However, the most significant feature of the new method is its reliability for detecting the exact boundaries of terraced areas.

In Smoleva and Velika Slevica there are no differences between the LIDAR and DEM5 data, which means that no difference was detected between active and abandoned terraces. According to the LIDAR and DEM 5 data analysis in Rodine, Dečja Vas, and Jeruzalem, there are small differences in detecting terrace coverage in the settlement. In Rodine there is a 5% difference, in Dečja Vas a 3% difference, and in Jeruzalem a 6% difference. Because of the specific terrain configuration and karst landscape, the terraces in Merče are extremely difficult to read both in the LIDAR model and in the field. There is only a three-hectare difference, but because of the small settlement areas this corresponds to a 12% difference. According to DMV5 data, active terraces cover over 135 hectares in Krkavče in more remote and difficult-to-access parts of the settlement. As much as 19% of terraces detected with LIDAR data areas are abandoned, totaling thirty-two hectares. According to LIDAR, terraced areas cover one-quarter (167 hectares) of the settlement's land. This is the second-largest difference, at 19%, and is due to detection of abandoned terraced areas. The greatest difference detected in coverage of terraced areas is in the largest pilot area of Rut, where the DEM5 method yielded twenty-six hectares of terraces and the LIDAR method thirty-six hectares of terraced areas, which is a massive 27% difference.

The basis of research for all projects connected with terraced areas involves inventorying terraced areas in the field. The results show that input data are extremely important and must be highly accurate to achieve the highest quality and best results possible.

With the introduction of LIDAR technology, recognized terraced areas increased significantly. The most important consequence is a new means of detecting terraces and terraced landscapes. On the basis of LIDAR DEMs, it is now possible to detect and define the terrace range, size, and boundary very quickly and with great accuracy. With this kind of accurate terrain measurement, the field survey is becomes redundant—or, when necessary, extremely limited. The anthropological component of LIDAR has extremely important research value in discovering abandoned overgrown landscape features, which was previously not possible without a great deal of fieldwork and enormous amounts of time.

The change of paradigm lies in the fact that orthophoto imagery is the most important underlay for interpreting terraced features and is essential for discovering terrace patterns in the landscape. With the implementation of better computer-processing algorithms, the introduction of neural networks and machine learning even automated detection is not far away in the future.

TERASIRANA OBMOČJA V SLOVENIJI: ZANESLJIVOST ODKRIVANJA Z LIDARJEM

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POVZETEK

Slovenija je država raznolikih tipov pokrajin. Terasirane pokrajine imajo med njimi zagotovo pomembno mesto. Ta privlačna območja niso naravnega izvora, ampak so delo človeških rok. Terase se med seboj razlikujejo po tipologiji in namenu. Najdemo jih na skoraj celotnem ozemlju Republike Slovenije. Sistematična obravnava terasirane pokrajine je še vedno zapostavljena. Predstavljeno delo je korak k boljšemu razumevanju tega pojava. Za izbrana pilotna območja, ki so bila analizirana z GIS orodji, so bile poleg natančnega obsega teras, analiz osončenja in naklona terena izdelane tudi karte zgodovinske analize rabe tal, na podlagi katerih je mogoča primerjava obsega terasiranih območij v preteklosti in v sodobnosti. V prispevku so opredeljeni osnovni pojmi in njihove razlage, ki so pomembni za identifikacijo območij s terasami. Vhodni podatki vsake raziskave imajo izjemen pomen in morajo biti zelo natančni, da lahko dosežemo najboljše rezultate. Osnova vseh raziskav, ki se ukvarjajo s terasami, je inventarizacija terasiranih območij na terenu. Pri tem se uporablja navadna metoda fotointerpretacije, ki ima nekatere slabosti. Slednje vplivajo na (ne)natančnost vhodnih podatkov pri raziskavah terasiranih območij. V študiji smo opisali osnovno metodo in potek dela za določanje terasiranih območij. Na podlagi novih LIDAR podatkov je prikazana prilagojena interpretacijska metoda določanja terasiranih območij. Rezultati stare in nove metode se v treh izbranih primerih ne razlikujejo, v dveh primerih so le nekoliko drugačni, v treh primerih pa je prišlo do bistvenih razlik.

Ključne besede: terasirana pokrajina, terase, LIDAR, digitalni model terena, Slovenija

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DIVERSITY OF TERRACED LANDSCAPES IN SLOVENIA

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ABSTRACT

This article presents the diversity of Slovenian terraced landscapes which is illustrated mainly at the level of Slovenian landscape types, focusing on a comparison of terraced landscapes in selected pilot settlements. In addition to basic GIS analyses based on LIDAR data, the diversity of metric parameters of characteristic terraced areas are also presented, highlighting the dimensions and configuration of terraces, their platforms and slopes, as well as their current land use. Attention is also drawn to the most recent processes transforming characteristic terraced landscapes.

Keywords: terraced landscape, terrace, land use, landscape metrics, Slovenia

DIVERSITÀ DEI PAESAGGI TERRAZZATI SLOVENI

SINTESI

L'articolo presenta la diversità dei paesaggi terrazzati sloveni che viene illustrata principalmente a livello degli tipi di paesaggio sloveni. La ricerca è incentrata sul confronto tra aree terrazzate presso villaggi pilota. Oltre alle basiche analisi GIS basate sui dati LIDAR viene presentata anche la diversità dei caratteristici parametri metrici delle aree terrazzate, evidenziando le dimensioni e la configurazione delle terrazze, le loro piattaforme e pendii, così come pure l'uso del suolo attuale. L'attenzione è inoltre rivolta ai più recenti processi di trasformazione dei paesaggi terrazzati caratteristici.

Parole chiave: paesaggio terrazzato, terrazzo, uso del suolo, le metriche del paesaggio, Slovenia

INTRODUCTION

Terraced landscapes are constructed cultural landscapes. Their aesthetic value is defined by a repeating pattern of terrace platforms and slopes, or hill slope geometrization. Terraced landscapes are spatial features with an exceptional physiognomy, in which terraces are the most important element of the cultural landscape (Ažman Momirski, Kladnik, 2015b).

Due to their typical landform, there are frequent attempts to typify agricultural terraces, which influence the terraced landscape aesthetics. The land-use typology of terraces (Ažman Momirski, Kladnik, 2009, 19) is widely accepted and used.

Relative to landscape diversity, only a few countries, even much larger ones, can be compared to Slovenia (Ciglič, Perko, 2013). In this tiny piece of central Europe, the Alps, the Dinaric Alps, the Pannonian Basin, and the Mediterranean meet and intertwine, as do Slavic, Germanic, Romance, and Hungarian cultural influences (Perko, 1997; Perko, 1998; Perko, 2007; Kladnik, Perko & Urbanc, 2009; Ciglič, Perko, 2012; Ciglič, Perko, 2013; Perko, Ciglič, 2015; Perko, Hrvatin and Ciglič, 2015). For this reason, Slovenia is renowned for its great geographical variety, which is also reflected in cultural terraces that build various terraced landscapes. Four major landscape types and nine subtypes can be distinguished (Figure 1; Kladnik, Perko & Urbanc, 2009).

Although Slovenia does not have terraces that rank among the best-known such landscapes in the world (i.e., those that are irrigated for rice production), Slovenian terraced landscapes are sufficiently diverse that they deserve special treatment. We seek to reveal their inner structure and to highlight the elements by which they differ from one another. Their diversity is also a consequence of the fact that Slovenia has a great variety of natural landscape types (Ciglič, Perko, 2013).

The international study of terraced landscapes reached its peak with the first two international conferences on terraced landscapes. At the first one, which took place in Mengzi, southwest China in November 2010, the International Terraced Landscapes Alliance (ITLA) was established and the Honghe Declaration on the protection and development of terraces (Junchao, 2012) was adopted. Together with over one hundred conference papers on various aspects of terraced landscapes from around the globe, this declaration was also published in extensive volumes in Chinese and English

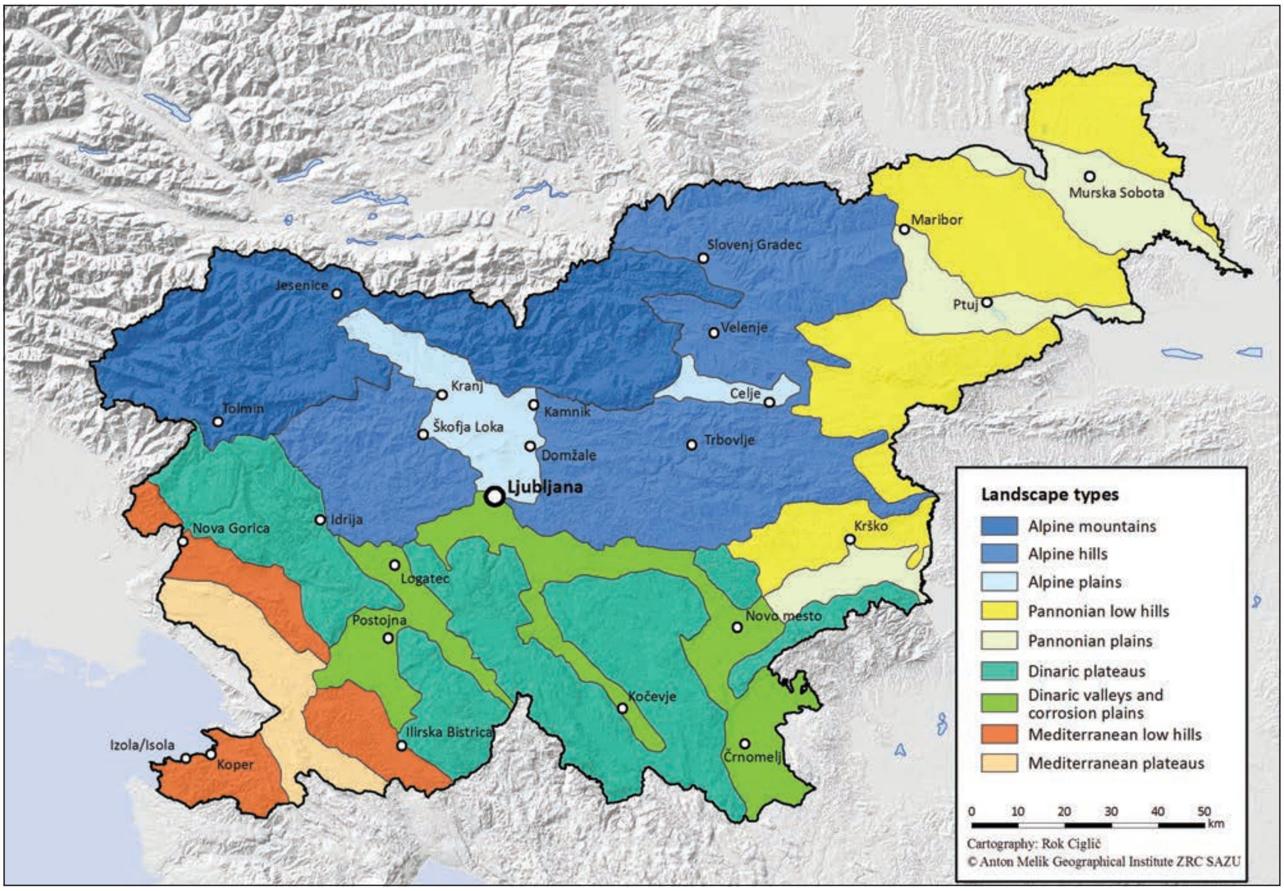


Figure 1: Slovenian landscape types.

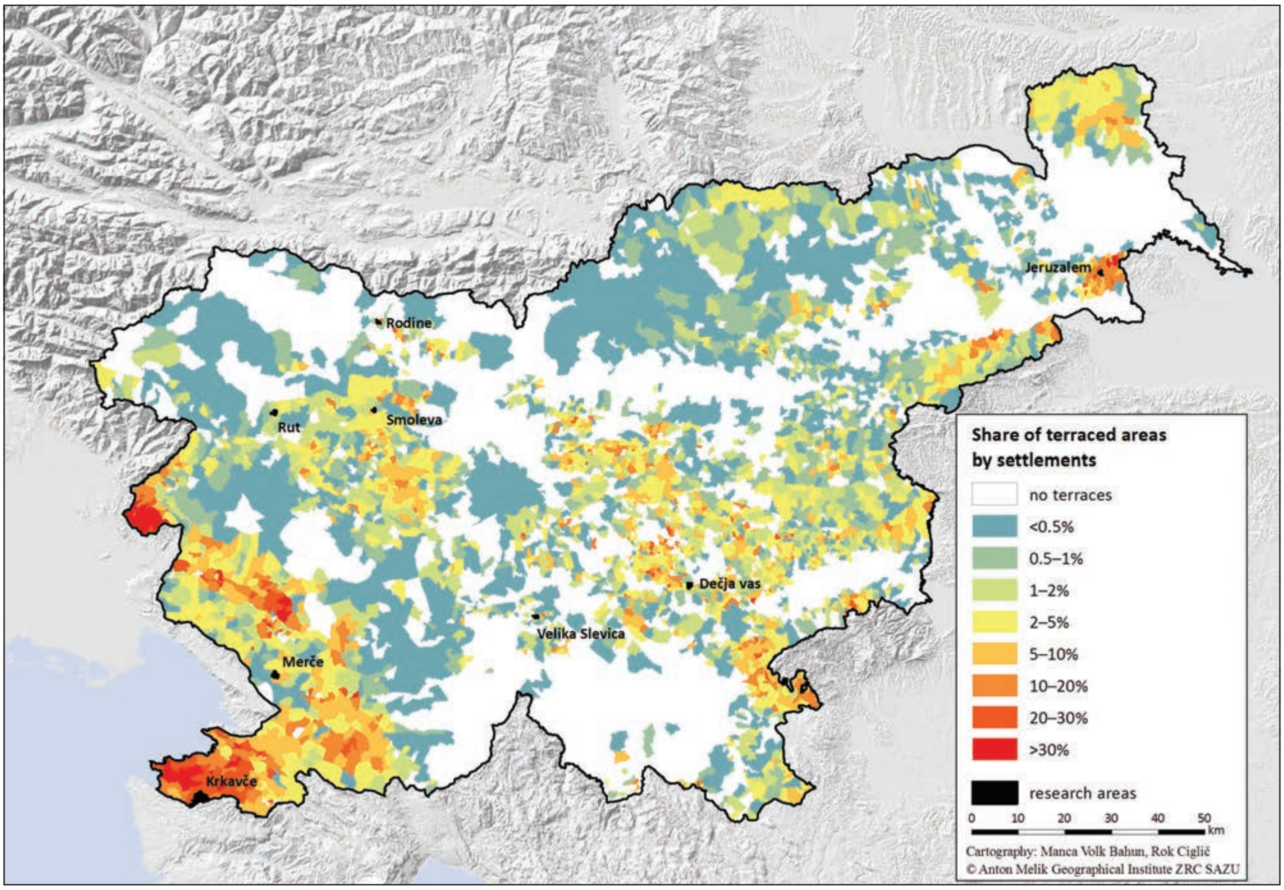


Figure 2: Share of terraced areas in Slovenia in 2015 and pilot settlements.

(Peters, Junchao, 2012, 8–9). The second ITLA conference was held in Cusco, Peru in May 2014. There were only a few presentations of European terraced landscapes. An extensive volume of conference proceedings (Tillmann, de Mesquita, 2015) also contains two Slovenian articles about factors in the conservation and decline of cultivated terraces in Slovenia (Ažman Momirski, Kladnik, 2015a) and Slovenia's best-known terraced landscape in the Gorizia Hills (Ažman Momirski, 2015).

An exhaustive chronological overview of research on cultivated terraces and terraced landscapes in Slovenia and an outline of Slovenian terraced landscapes were only published a few years ago (Ažman Momirski, Kladnik, 2009). Also noteworthy is a comparative study of land-use changes in the Mediterranean terraced settlements of Krkavče in the Koper Hills and Ostrožno Brdo in the Brkini Hills (Ažman Momirski, Gabrovec, 2014), a study created based on fieldwork in selected Slovenian terraced landscapes (Križaj Smrdel, 2010), and the volume *Terasirana pokrajina Goriških brd* (Terraced Landscapes of the Gorizia Hills; Ažman Momirski et al., 2008), which still remains the most in-depth study of a Slovenian terraced landscape. The extensive volume *Terasirane pokrajine* (Terraced Landscapes; Kladnik et al., 2016) was published in April 2016, upon the seventieth anniversary of the ZRC SAZU Anton Melik Geographical Institute. In addition to terraced landscapes in Slovenia, it presents other terraced landscapes around the world, as well as natural and manmade non-agricultural terraces.

The aim of the article is to present geographical distribution and characteristics of selected typical terraced landscapes in Slovenia. The metric characteristics and the qualities of individual terraces or their components (terrace platforms and terrace slopes) were analysed that together create characteristic terraced landscapes. Detailed investigations were done in the pilot settlements areas[1], whereby for each landscape type we selected one characteristic settlement with terraced terrain (Figure 2): for Mediterranean low hills the pilot settlement was Krkavče, for Mediterranean plateaus Merče, for Dinaric plateaus Dečja vas, for Dinaric valleys and cor-

1 Eight pilot areas were selected and examined in the applied research project "Terraced Landscapes in Slovenia as Cultural Values" (no. L6-4038).

rosion plains Velika Slevica, for Alpine mountains Rut, for Alpine hills Smoleva, for Alpine plains Rodine, and for Pannonian low hills Jeruzalem. The exception was the landscape type Pannonian plains, where terracing accounted for only 0.05% of the land and therefore no pilot settlement was selected.

DATA

In order to assess the geographic distribution and characteristics of agricultural terraces in Slovenia we employed color digital ortophoto images (DOPs; Digitalni orto …, 2011–2015), with a resolution of 0.50 m, records of the actual utilization of agrarian and forest lands kept by the Ministry of Agriculture, Forestry and Food (Podatki o dejanski rabi tal, 2015), data obtained from aerial laser scanning (Light Detection and Ranging, 2015), and a digital elevation model (DEM; Digitalni model višin, 2009–2011).

We also used a 1:5,000 base topographic map layer, or 1:10,000 for mountainous areas (Temeljni topografski načrt 1:5000 and 1:10.000, 1993–1995), in which agricultural terraces are marked with a special easy-to-recognize topographic symbol. We analyzed the terraced areas identified in this way using geoinformation tools to determine their elevation, aspect, inclination, bedrock composition (Litostratigrafska karta Slovenije, 2011; Zemljevid tipov kamnin, 2012), and land use.

The cartographic representation of land use in the cadastral survey carried out under Emperor Francis I (the Franciscean cadaster) in the 1820s was also used. The 1:2,880 maps of the Franciscean cadaster for the cadastral municipalities with seven of the eight pilot settlements are accessible at the Archives of the Republic of Slovenia in Ljubljana, and the maps for Krkavče are kept at the State Archives in Trieste. A more detailed overview of the Franciscean cadaster maps used is given in Table 1.

The interpretation key for the Records on Actual Land Utilization (Interpretacijski ključ, 2013) was used although it treats the slopes of terraced areas differently. Applied to the category "field" is a provision specifying that utilization also includes the terrace slopes between the fields with a ground floor no wider than 2 m. Applied to vineyards and orchards is a rule stipulating that this type of utilization includes all "*overgrown and grassed slopes of vineyard terraces that show an example of good agricultural and environmental practice of preventing erosion*" (Ažman Momirski, Gabrovec, 2014, 35).

BASIC CHARACTERISTICS OF CULTURAL TERRACES IN SLOVENIA

In order to better understand the details of the pilot areas presented below, we first present some basic characteristics of cultural terraces in Slovenia (Table 2) and then focus on the main attributes of the pilot areas. Slovenia is crisscrossed by cultivated terraces in a way that few other European countries are. With exception of Pannonian plains terraces appear in all Slovenian landscape types (Ažman Momirski, Kladnik, 2009; Ažman Momirski, Kladnik, 2012) and 1.71% of land has been reworked into agricultural terraces. By far the greatest share is in Mediterranean landscapes (8.96%), whereas everywhere else the share is below average. The "hotspots" of terraced landscapes are clearly visible in Figure 2, where they stand out as contiguous red and orange areas.

Terraces in Slovenia appear at elevations from 0 to nearly 1,200 m (the Bukovnik farm, the highest in Slovenia, lies at an elevation of 1,327 m), and in terms of area

Table 1: Franciscean cadaster maps used.

Landscape types	Pilot settlement	Archive call number	Time created
Mediterranean landscapes			
Mediterranean low hills	Krkavče	AST-179, I/FJ/I43	1817–1825
Mediterranean plateaus	Merče	AS-179, G/FJ/G131	1817–1825
Dinaric landscapes			
Dinaric plateaus	Dečja vas	AS-176, N/N214	1818–1828
Dinaric valleys and corrosion plains	Velika Slevica	AS-176, N/N93	1818–1828
Alpine landscapes			
Alpine mountains	Rut	AS-179, G/FJ/G64	1817–1825
Alpine hills	Smoleva	AS-176, L/L175	1818–1828
Alpine plains	Rodine	AS-176, L/L45	1818–1828
Pannonian landscapes			
Pannonian low hills	Jeruzalem	AS-177, M/F/M476	1819–1825
Pannonian plains	–	–	–

Table 2: Terraced areas within Slovenian landscape types by lithology, aspect, and land use.

Landscape type	Share of terraced areas (%)	The predominant rock type of terraced area and its share (%)	The predominant aspect of terraced area and its share (%)	The predominant land-use category of terraced area in 2015 and its share (%)
Mediterranean low hills	12.39	Flysch 89.4	SW 14.9	Meadows and pastures 22.3
Mediterranean plateaus	3.56	Carbonate rock 79.7	SW 23.5	Meadows and pastures 53.9
Dinaric plateaus	0.69	Carbonate rock 64.3	S 19.4	Meadows and pastures 61.3
Dinaric valleys and corrosion plains	1.60	Carbonate rock 62.5	S 19.9	Meadows and pastures 59.8
Alpine mountains	0.21	Carbonate sedimentary rock 45.8	S 30.7	Meadows and pastures 83.3
Alpine hills	1.46	Carbonate rock 42.4	S 22.6	Meadows and pastures 78.4
Alpine plains	0.38	Carbonate sedimentary rock 56.6	S 36.2	Meadows and pastures 76.9
Pannonian low hills	1.86	Non-carbonate sedimentary rock 44.9	SE 16.8	Vineyards 29.8
Pannonian plains	0.05	Non-carbonate sedimentary rock 62.9	E 18.6	Meadows and pastures 40.5

the majority can be found in an elevation band between 200 and 300 m (21.2%).

With regard to rock composition, three types strongly stand out. Of these, 39.8% are on underlying flysch, which is characteristic of Mediterranean Slovenia. A further 27.3% of terraces are on dolomite and limestone, which are common in Dinaric and Alpine regions, and 13.9% are on non-carbonate sedimentary rock, common in Pannonian landscapes.

Nearly half of all terraces (45.0%) are on moderately sloping terrain with an inclination from 15 to 30% (from 8.6 to 16.7°). The steepest terraced slopes are found in Alpine hills (42.5% of them are on slopes with an inclination of 30 to 50%, from 16.8 to 26.6°), and the gentlest ones are on Mediterranean plateaus, where a full 65.0% of them are on slopes with an inclination of no more than 15% (8.5°).

Currently, most terraced land is used for meadows and pastures (44.6%), followed by vineyards with a significantly smaller share (15.7%). Fields account for 8.2% of terraced areas, orchards 5.6%, and olive groves 3.6%. 9.0% of terraced areas are being overgrown by bushes and trees, and 8.9% have been overgrown by forest. The actual area of terraced land that has undergone afforestation is considerably greater because we are certain that DOP digitization was unable to inventory all such terraces. Olive groves are exclusively connected with Mediterranean low hills, where they are planted on 9.3% of the terraced areas there. Vineyards are most common on terraced areas of Pannonian low hills and Mediterranean low hills (29.8 and 25.2%), where there are also the most orchards (8.0 and 7.1). Fields are by far most common in Pannonian low hills (17.8%), Pannonian plains (16.6%), and Dinaric valleys and on corrosion plains (14.8%).

Most Slovenian terraces have a southern or southwest aspect (20.2 and 16.3%, respectively). Despite the dominance of meadows and pastures on terraces in cold and steep Alpine landscapes, exposure to solar radiation there is considerably more important than in the warmer more intensively cultivated Mediterranean landscapes.

Therefore, strong predomination of southern exposures is characteristic for Alpine plains (36.2%) and Alpine mountains (30.7%). For the Pannonian landscapes, alongside southern exposures there is a higher than average share of eastern and western exposures, whereas aspect is relatively the least important factor in terracing in Dinaric landscapes, with a strong predominance of terraces covered in meadows and pastures.

Terraces in western Slovenia were probably built as early as Roman times, whereas in Pannonian Slovenia terracing is a relatively new phenomenon. Data indicate that the first terraced plantation in the Drava Valley (NE Slovenia) wine-growing area was built in the settlement of Gruškovec in the Haloze region between 1892 and 1899 (Bračič, 1967). After the Second World War, the terracing of slopes was promoted by large state-owned holdings due to easier and more profitable farming on steep slopes (Belec, 1968) while the terraces were abandoned in other areas. The abandonment of agricultural terraces is not a new phenomenon because early studies by Vrišer (1954), Melik (1960), and Titl (1965) reported the extensive abandonment of cultivated terraces in western Slovenia. This suggests that abandonment is a long-term process with numerous causes (Ažman Momirski, Kladnik, 2015a). The greatest share of abandoned terraces that have already undergone afforestation was found in Mediterranean low hills (13.9%) and Dinaric plateaus (12.0%).

METHODS

Using the above mentioned data we determined the location, purpose, and characteristics of terraces in pilot areas which represent typical Slovenian landscapes, namely Alpine, Dinaric, Mediterranean, and Pannonian. Characteristics of individual representative terraces were analyzed through fieldwork and by measuring the length of terraces and height of terrace slopes using geoinformation tools based on a DEM with a resolution of 1 m. Based on elevation in the DEM and a shaded relief map, we measured the longest terraces and created characteristic cross-sections of terraced slopes within individual pilot areas. In this manner, we also obtained information about the greatest lengths of terraces and the heights of the terrace slopes, which we double-checked through field measurements.

For every pilot settlement area, we used digitization of terraced areas to determine the number of terraced patches (NTP), after which we also calculated mean terraced patch area (MTPA), total length of terraced patch edges (TLTPE), mean length of terraced patch edge (MLTPE), and density of terraced patch edges (DTPE), which reflect the diversity and fragmentation of a terraced landscape in a particular area.

For spatial pattern analyses to determine land-use diversity within terraced areas in individual pilot settlements areas and to compare them with one another, we used some indicators from FRAGSTATS software, version 4 (McGarigal, Cushman & Ene, 2012; McGarigal, 2015). This is an improved version of a basic study (McGarigal, Marks, 1994; McGarigal, Marks, 1995) that provides thorough insight into the interior landscape structure. The selected indicators show whether a particular landscape is diverse in terms of the number of land-use categories in it and with regard to the presence or distribution of each individual category.

For this analysis, we used the program V.LATE (Lang, Tiede, 2003) to calculate the landscape metrics.

We used four indicators. Patch richness (PR; Patch Richnes, 2015; McGarigal, Marks, 1994; McGarigal, 2015) equals the number of different patch types present within the landscape boundary. In our case, this is the number of different land-use types. Relative patch richness (RPR; Relative Patch Richness, 2015; McGarigal, Marks, 1994; McGarigal, 2015) equals the number of different patch types present within the landscape boundary divided by the maximum potential number of patch types specified by the user, based on the particular patch type classification scheme, multiplied by 100 (to convert to percent). In our case, the maximum number (eleven land-use categories) is the total number of land-use categories in all eight pilot settlements. The Shannon's diversity index (SHDI; Shannon's Diversity Index, 2015; McGarigal, Marks, 1994; McGarigal, 2015) equals the negative sum across all patch types (*m*) of the proportional abundance (P_i) of each patch type multiplied by that proportion:

$$SHDI = -\sum_{i=1}^{m}(P_i \ln P_i)$$

The SHDI value is 0 when the landscape contains only 1 patch (i.e., no diversity), and increases as the number of different patch types (i.e., patch richness, PR) increases and/or the proportional distribution of the area among patch types becomes more equal. The higher the SHDI value, the more diverse the landscape is regarded.

Shannon's evenness index (SHEI; Shannon's evenness index, 2015; McGarigal, Marks, 1994; McGarigal, 2015) is calculated in the following form (the observed value of Shannon's diversity index is divided by the maximum value of Shannon's diversity index):

$$SHEI = \frac{SHDI}{SHDI_{max}}$$

The SHEI value is constrained between 0 and 1 and tells how close a certain landscape's diversity is to the maximum diversity (according to a given number of land categories). Maximum diversity is achieved when all of the categories have the same area ratio; for example, when the area share of each of four categories is

Table 3: Share (%) of terraced areas and main characteristics of terraces in the pilot settlement areas.

Landscape type	Share of total terraced areas (%) within landscape type	Pilot settlement	Total area (m^2)	Terraced areas (m^2)	Share of terraced areas (%)	Lower elevation limit of terraced areas (m)	Upper elevation limit of terraced areas (m)	Length of longest terrace (m)	General form of terrace platform	Average height of terrace (terrace platform and slope together) (m)	General characteristics of terrace slope	Height of highest terrace slope (m)
Mediterranean low hills	12.39	Krkavče	6,446,560	2,310,853	35.8	10	275	200	Level, gently sloping	2.65	Earthen, steep to diagonal, grassy, dry walls rare	3
Mediterranean plateaus	3.56	Merče	3,923,510	520,408	13.3	350	445	210	Gently sloping	1.55	Dry walls, earthen, step, covered in bushes	2
Dinaric plateaus	0.69	Dečja vas	3,056,900	610,009	20.0	318	365	250	Gently sloping	2.25	Earthen, steep, grassy	2.5
Dinaric valleys and corrosion plains	1.60	Velika Slevica	1,136,520	271,418	23.9	549	635	800	Moderately sloping	1.90	Earthen, steep, grassy	2
Alpine mountains	0.21	Rut	10,174,200	438,177	4.3	590	820	330	Moderately sloping	3.20	Earthen, steep to diagonal, grassy, dry walls rare	5
Alpine hills	1.46	Smoleva	1,831,300	201,589	11.0	495	860	220	Gently to moderately sloping	8.00	Earthen, steep to diagonal, grassy, partially planted with fruit trees and bushes	8
Alpine plains	0.38	Rodine	1,806,220	223,084	12.4	508	585	220	Gently sloping	3.15	Earthen, very diagonal, grassy	3
Pannonian low hills	1.86	Jeruzalem	598,348	244,567	40.9	280	342	725	Level	1.75	Earthen, diagonal, grassy	2.5
Pannonian plains	0.05	–	–	–	–	–	–	–	–	–	–	–

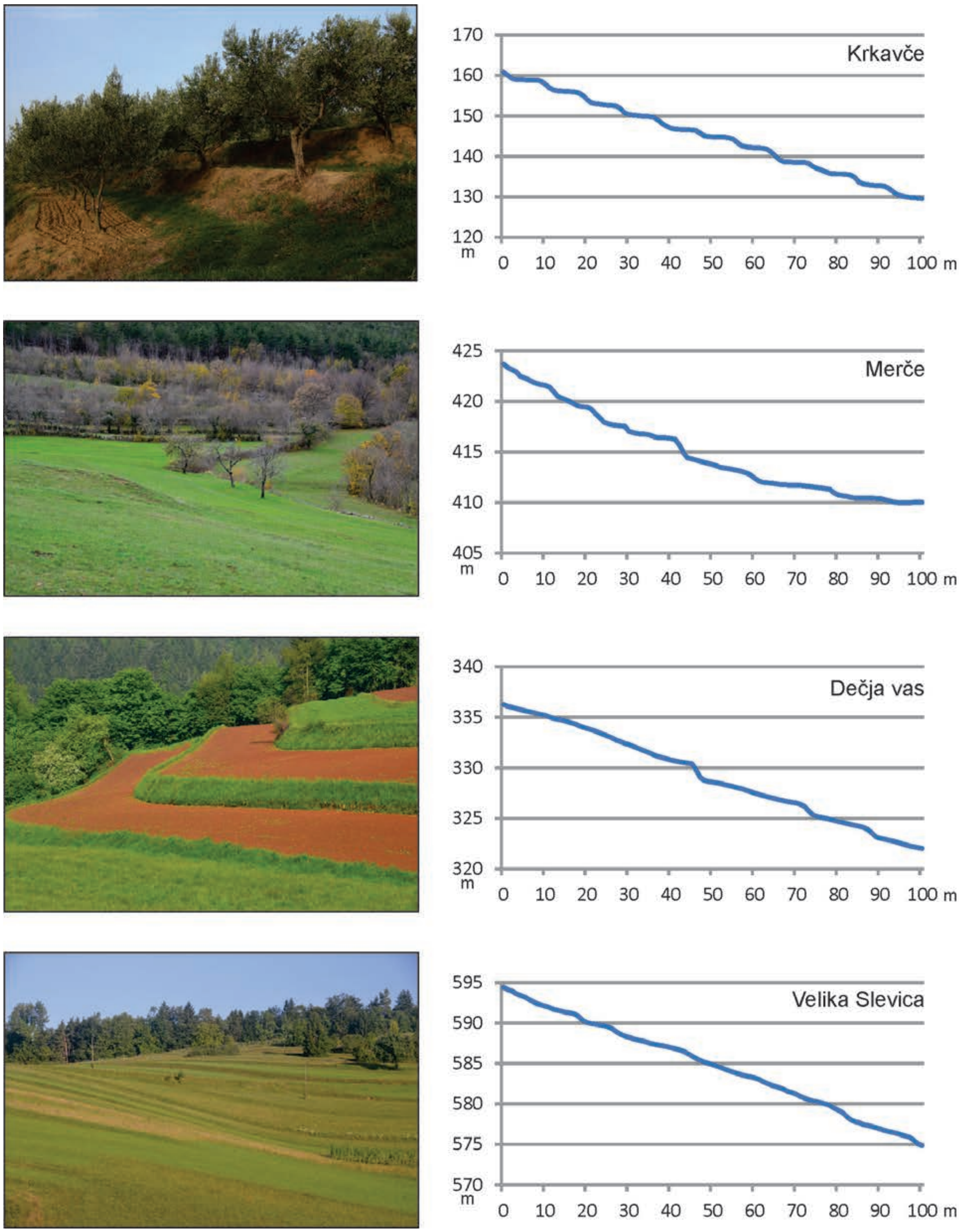


Figure 3: Photos of terraces in pilot settlement areas and cross-sections of terraced slopes in pilot settlement areas.

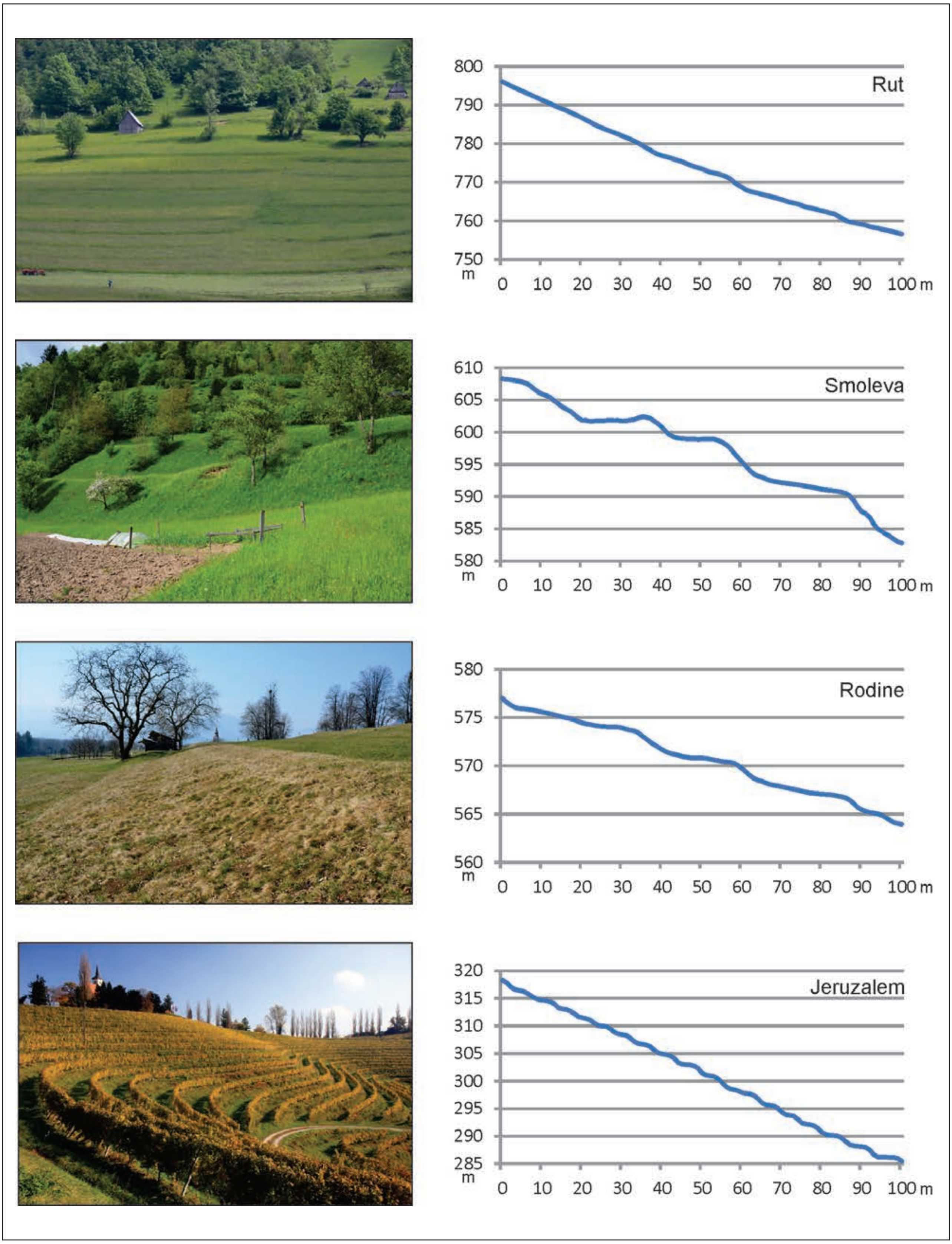


Figure 3: Photos of terraces in pilot settlement areas and cross-sections of terraced slopes in pilot settlement areas.

25%, or when each of five categories has a 20% share. It is directly comparable only for areas with the same number of categories (in our case, land-use categories).

Assessments of aesthetic value and exposure to landslide hazard, overgrowth, and planned transformation were carried out based on a field investigation and comparison of terraced areas in the selected pilot settlements.

RESULTS

The results at the level of settlements as representative units for individual Slovenian landscape types are presented in tabular form (Tables 3–6) and further detailed in Figure 3. The text gives only a condensed overview of the most significant findings important for understanding the topic at hand.

The analyses with geoinformation tools revealed that slope aspect and inclination in the pilot settlements agrees considerably with that at the level of the corresponding landscape types.

The shares of terraced areas on the village land of the pilot areas vary greatly, from 4.3% in Alpine settlement Rut to 40.9% in the winegrowing village of Jeruzalem as a representative of Pannonian low hills. In all cases, the terraced areas lie near the settlement cores because this was the easiest way for farmers to manage them while intensively cultivating them. The following principle applies: the greater the share of terraced land, the more this is scattered around the village settlement cores. In the settlements studied, terraces are distributed at elevations between 10 and 860 m, whereby the greatest elevation differences are in the pilot settlement of Smoleva as a representative of Alpine hills.

The physical characteristics of the terraces that make up terraced landscapes differ considerably from one another. The longest terraces are in the villages of Velika Slevica and Jeruzalem (up to 800 m).

Terrace platforms vary in their width.

They are level only in the narrow belts of vineyard terraces in Jeruzalem and in places in Krkavče, otherwise they gently slope outwards, and in the hilliest settlement of Rut and in Velika Slevica, where the low earthen terrace slopes make them relatively indistinct, their inclination is considerable. In Rodine the terrace slopes are so gently sloping that it is quite difficult to distinguish them from the even more gently sloping terrace platforms. Rather diagonal terrace slopes are seen in the vineyard terraces in Pannonian low hills, whereas steep terrace slopes predominate elsewhere.

The highest terrace slopes by far are found in Smoleva, where they have a height of up to eight meters in the lower part of the terraced land. Otherwise in most of the

Table 4: Some indicators of the presence of terraced areas in the pilot settlements areas.

Landscape type	Pilot settlement	Total area (m^2)	Terraced areas (m^2)	Share of terraced areas (%)	Total number of terraced patches (NTP)	Mean terraced patch area (MTPA) (m^2)	Total length of terraces patch edges (TLTPE) (m)	Mean length of terraced patch edge (MLTPE) (m)	Density of terraced patch edges (DTPE) (m/ha)
Mediterranean low hills	Krkavče	6,446,560	2,310,853	35.8	1216	1,900	259,918.3	213.75	1,124.77
Mediterranean plateaus	Merče	3,923,510	520,408	13.3	332	1,567	73,766.83	222.19	1,417.48
Dinaric plateaus	Dečja vas	3,056,900	610,009	20.0	216	2,824	47,163.98	218.35	773.17
Dinaric valleys and corrosion plains	Velika Slevica	1,136,520	271,418	23.9	138	1,967	21,711.05	157.33	799.91
Alpine mountains	Rut	10,174,200	438,177	4.3	161	2,722	30,038.41	186.57	685.53
Alpine hills	Smoleva	1,831,300	201,589	11.0	70	2,880	19,250.07	275.00	954.91
Alpine plains	Rodine	1,806,220	223,084	12.4	59	3,781	14,595.00	247.37	654.24
Pannonian low hills	Jeruzalem	598,348	244,567	40.9	65	3,763	11,607.11	178.57	474.60
Pannonian plains	–	–	–	–	–	–	–	–	–

Table 5: Some indicators of the diversity of terraced areas in the pilot settlements areas.

Landscape type	Pilot settlement	Total area (m²)	Terraced areas (m²)	Share of terraced areas (%)	Number of possible land-use categories	Patch richness (PR)	Relative patch richness (RPR) (%)	Shannon's diversity index (SHDI)	Shannon's evenness index (SHEI)
Mediterranean low hills	Krkavče	6,446,560	2,310,853	35.8	11	9	81.82	1.835	0.835
Mediterranean plateaus	Merče	3,923,510	520,408	13.3	11	8	72.73	1.013	0.487
Dinaric plateaus	Dečja vas	3,056,900	610,009	20.0	11	7	63.64	1.017	0.522
Dinaric valleys and corrosion plains	Velika Slevica	1,136,520	271,418	23.9	11	7	63.64	0.562	0.289
Alpine mountains	Rut	10,174,200	438,177	4.3	11	6	54.55	0.671	0.374
Alpine hills	Smoleva	1,831,300	201,589	11.0	11	6	54.55	0.999	0.558
Alpine plains	Rodine	1,806,220	223,084	12.4	11	6	54.55	0.663	0.370
Pannonian low hills	Jeruzalem	598,348	244,567	40.9	11	8	72.73	0.393	0.189
Pannonian plains	–	–	–	–	–	–	–	–	–

settlements studied they do not exceed three meters in height, which is also their extreme value, because in Velika Slevica, Rut, and Merče, for example, most of them are less than one meter in height.

Considering more or less oblique terrace platforms as part of the terrace slopes, together with which they form the terraces, on average the highest terraces by far are in Smoleva (8 m), followed by terraces in Rut (3.2 m) and Rodine (3.15 m), whereas the lowest and thus least distinct are in Merče (1.55 m) and Velika Slevica (1.9 m), and also in Jeruzalem (1.75 m).

Everywhere except in Merče, where a large portion of the terrace slopes are formed with dry walls, earthen terrace slopes predominate. Individual terrace slopes are also formed with dry walls in Krkavče and Rut, where, just as in the entire Soča Valley, the influences of the Mediterranean cultural environment can be felt.

In the majority of settlements they are overgrown with grass, only in Merče are they overgrown with thick bushes, and in Smoleva in addition to bushes they are also reinforced by occasional fruit trees.

The greatest number of terrace patches by far with various land use is found in Krkavče (1,216), whereas in Rodine (59), Jeruzalem (70), and Smoleva (70) their number is less than one hundred. The number of terrace patches depends on the size of the village territory, and so the information about the mean patch area is significantly more informative. This also shows the diversity of land use. The largest mean patches are in Rodine (3,781 m²) and Jeruzalem (3,763 m²), and the smallest are in Velika Slevica (1,967 m²), Krkavče (1,900 m²), and especially in Merče (1,567 m²). Regarding individual land-use categories, the greatest among all of these is the vineyard patch in Jeruzalem (31,365 m²). This points to the relative monotony of the terraced landscape there, which in no way reduces its aesthetic attractiveness. On average, the meadow and pasture patches in Rodine (26,641 m²) and Rut (25,996 m²) are not much smaller.

The size of the patches is also related to the lengths of their edges, which however do not have exactly the same ratio because individual patches vary in the complexity of their shape. Thus the patches with the longest edges are in Smoleva (275 m), and the shortest in Velika Slevica (157 m). The greatest density of edges is in Merče (1,417 m/ha) and the smallest in Rut (685 m/ha).

Out of all eleven possible land-use categories that appear in all of the pilot settlements areas, the most can be found in Krkavče (nine), followed by Merče and Jeruzalem (eight each). Therefore Krkavče also has the greatest relative richness (81.8%), and the lowest (54.6%) is found in the Alpine pilot settlements of Rut, Smoleva, and Rodine, which each have six different land-use categories. This is also confirmed by the calculated values of Shannon's evenness index (SHEI), which express the

Table 6: Some valuations of a terraced landscape based on observations of terraced areas in pilot settlements areas.

Landscape type	Pilot settlement	Aesthetic, experiential value	Exposed to landslides	Exposed to overgrowth	Exposed to planned transformation
Mediterranean low hills	Krkavče	Great	Moderate	Great	Moderate
Mediterranean plateaus	Merče	Low	None	Great	Low
Dinaric plateaus	Dečja vas	Medium	Low	Moderate	Low
Dinaric valleys and corrosion plains	Velika Slevica	Medium	Low	Low	Low
Alpine mountains	Rut	Great	Low	Moderate	Low
Alpine hills	Smoleva	Medium	Moderate	Great	Low
Alpine plains	Rodine	Low	Low	Low	Low
Pannonian low hills	Jeruzalem	Exceptional	Great	Low	Great
Pannonian plains	–	–	–	–	–

ratio between the calculated and highest possible SHDI for a particular number of categories. In Jeruzalem a high number of land-use categories are represented (eight out of eleven possible), but only one of them, vineyards, occupies a considerable amount of the terraced land because the SHEI value is only 0.189 or 18.9% of total possible diversity (for eight categories this is 2.079). The situation is different in Krkavče, where great diversity is evident because the SHEI value is 0.835 or 83.5% of total possible diversity, which is 2.197 for nine categories. Thus Shannon's diversity index (SHDI), which is higher if there are more categories and if these are equally distributed, is the highest by far in Merče (1.835), and the lowest by far in Jeruzalem (0.393), which is more evidence of the diversity of the landscape of Mediterranean low hills and the "monotony" of the intensive vineyard cultivation of Pannonian low hills.

In the pilot settlements, terraced areas differ in their exposure to overgrowth, which is most intense in both of the Mediterranean pilot settlements (Krkavče and Merče) and in Alpine hills (the pilot settlement of Smoleva). They also differ in their exposure to landslide risk; this is greatest in Pannonian low hills (the pilot settlement of Jeruzalem), whereas this danger is practically non-existent in the pilot settlement of Merče as a representative of Mediterranean plateaus.

The aesthetically most attractive landscape is the geometrically regular planned terraced landscape in the Jeruzalem Hills, which however is threatened by the planned rearrangement of terraced vineyards into vertical plantations, which are more profitable. There are also aesthetically very attractive terraced landscapes in the Koper Hills (in Krkavče) and on the southern slopes of the Lower Bohinj Mountains (in Rut). In the first case, the proximity of the coast, which is well developed for tourism, exerts a certain pressure on their degradation, which is reflected in unplanned construction, unsupervised overgrowth, and the transfer of land ownership to people moving to the area from Slovenia's interior, who mostly engage in unsustainable farming because of a lack of agricultural skills.

DISCUSSION

Terraces occur in all Slovenian landscape types, but they vary in terms of density, purpose, and current functions (Ažman Momirski, Kladnik, 2015a). Large variety is related to underlying geographical processes that operate at different time and spatial scales and trigger changes in the landscape. The ones presented below specifically affect terraces as an important landscape element. The most important factor that affects terraced landscapes is probably constant land-use changes. Fundamental changes in land use in terraced areas between the eras of subsistence-oriented farming and modern global farming are clearly shown in a comparison of the diagrams in Figures 5 and 6. The Franciscean cadaster was created in the period before the maximum number of rural inhabitants around 1900 (Kladnik, 2003), but it clearly indicates subsistence farming. Despite this, in Jeruzalem, Krkavče and Merče there was already a perceptible exceptional role of market-oriented viticulture, which at that time in Jeruzalem was based exclusively on vertical plantations of grapevines. Today, the share of vineyards has decreased everywhere, most noticeably in Krkavče. A comparison of the two diagrams clearly shows a decrease in the presence of fields in terraced areas in all areas except Krkavče. An exception is Dečja vas in Dry Carniola (*Suha krajina*), which is an example of a traditional settlement where development has

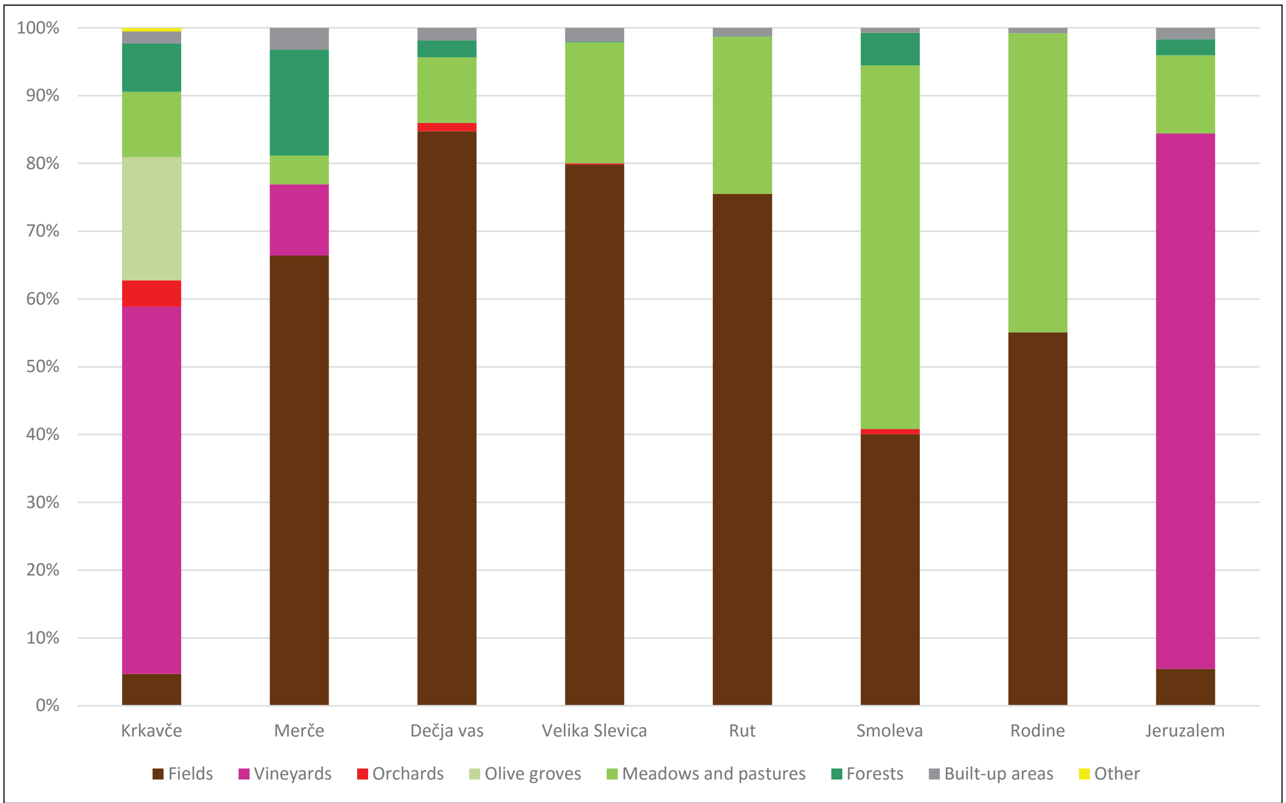


Figure 4: Land use in the terraced areas in the pilot settlements areas according to the Franciscean cadaster (between 1817 and 1828).

lagged and subsistence farming still plays an important role; half of the terraces there are still occupied by fields. Noteworthy is also the strong growth in afforested terraced areas in Krkavče, Smoleva, and Merče, where there was already considerable forest cover at the time of the Franciscean cadaster, and in Rut.

In many areas land use changes depended on social changes and contributed to the abandonment of terraced landscapes or their extensification. This often led to degradation processes, among which the most significant are soil erosion and slope instability in the form of landslides. Such degradation is the result of intense precipitation and poor maintenance of support walls. This is mostly an irreversible process because recultivation rarely takes place (Crosta, Imposimato & Roddeman, 2003; Komac, Zorn, 2005; Zorn, Komac, 2007; Gabrovec, Komac, Zorn, 2012; Zorn, Komac, 2013).

When looking at the development of terraced landscapes, one cannot ignore the influence that terrace construction techniques have on their formation. These are changing from manual to mechanical techniques, which became established together with mechanization in the construction business. The construction and deterioration of terraces were the two prevalent stages of transformation during the manual construction era (Ažman Momirski, Kladnik, 2009).

With changes in land use, construction and management techniques, the diversity of terraced landscapes has generally decreased, especially if one considers the diversity of raising field crops, where cultivars are constantly changed through crop rotation. It is different in Krkavče and to some extent in Merče, where, due to the multiple interests of the locals and many newly arrived landowners, it is even possible to see an increase in landscape diversity – which is represented in terraced land overgrown and in the presence of the majority of land-use categories, within which various use can be identified.

CONCLUSION

The study of terraced landscapes intensified at the end of the twentieth century. The EU included cultivated terraced landscapes in its 2007–2013 rural development plan and its agricultural biodiversity action plan (to improve or maintain biodiversity and prevent its decrease due to agricultural activities). The preservation and maintenance of terraced landscapes is also among the priorities of the thematic strategy for soil protection. The EU also supports areas with limited development opportunities and agricultural areas with highly ranked natural values, which in many cases include terraced land (Lasanta et al., 2013).

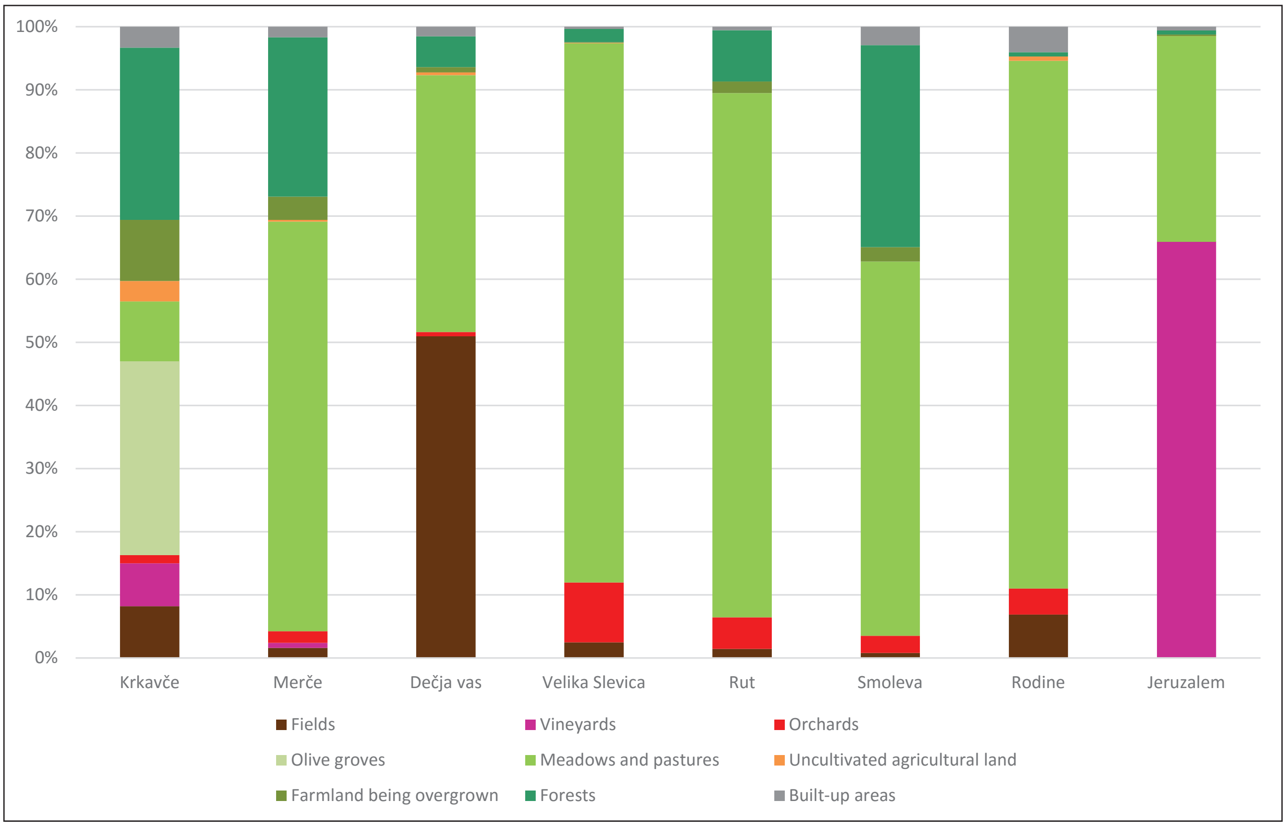


Figure 5: Land use in the terraced areas in the pilot settlements areas in 2015.

The diversity of terraced landscapes in Slovenia is a result of varied natural, social, and economic conditions. This diversity has been influenced by natural conditions and historical development, not only in more distant time periods, but also during the sociopolitical changes that took place in the last decades.

The intensity with which terraces are used is significantly affected by modern developmental trends (industrialization, urbanization, and globalization), which are accompanied by pronounced demographic changes. In Slovenia, these are primarily a decreasing number of people engaged in farming, rural depopulation, and population aging, as well as changes in the rural lifestyle and, not least of all, in farming itself. In some areas, terraced landscapes are therefore subject to modernization, whereas on other land abandonment is contributing to significant changes to them. Our analysis presents some geographical and spatial aspects of these phenomena.

We analyzed the relations between terraced landscapes and some characteristics of geographical space, such as land use, slope inclination, and aspect. This analysis was made using a GIS analysis of Slovenian territory at 25 × 25 m resolution. Because the data were collected by digitalization of DOP images and topographic maps, their accuracy is rather low and the data can only be used at the regional level. On the other hand, the basic characteristics of terraces, such as the length of their edges and number of terrace patches, were presented based on the example of pilot areas. Pilot settlements were analyzed using lidar data with a high resolution of 1 m and broad possibilities for future use, including analysis of short-term and long-term changes in land use and vegetation. The pilot settlements were selected to represent typical Slovenian landscapes.

Based on our analysis of pilot areas we argue that different processes have shaped the terraced areas in different Slovenian landscapes. In Mediterranean landscapes, cultivated terraces have been a significant feature that has shaped the appearance of the landscape for centuries. In the past, the dominant pattern was terraces with non-uniform heights and widths, with slopes reinforced with walls made of large flysch stones. Now, due to mechanical cultivation, the shape of terraces is becoming increasingly uniform. Most of the terraces are used for vineyards and orchards, and for olive cultivation. Modern viticultural terraces were constructed after mechanized farming was introduced. They are regularly renovated and rebuilt, and are in good shape compared to terraces in remote areas. In some places, especially in the Brkini Hills, grass has replaced the tilled fields and orchards that were predominant several decades ago.

Terraces in the Dinaric landscapes are less intrusive

in the landscape because they are usually not entirely flat and the slopes between them are not very high. Because terraces are adapted to the terrain, their design is not uniform. Here, traditional agricultural terraces prevail and are a persistent landscape element although the prevailing land use is grassland. Except for a few exceptions, new terraced land was not detected, although in places small terraces have been joined into larger, broader ones with higher slopes.

In Alpine landscapes, construction of terraces was very difficult. Even though terraces adapt to the terrain, in many places they have quite a uniform shape, with similar dimensions, which is especially true regarding their inclination, the width of the terrace platforms, and the height of the slopes. The most common type is traditional agricultural terraces, which were used for tilled fields in the past, but now have been converted into meadows, which also dominate on hillslopes with a southern exposure. There are no new terraces, and old ones are being abandoned and overgrown, and are deteriorating in many places.

The Pannonian hilly landscapes have exclusively been used for vineyards and fruit orchards since the very beginning. Viticultural terraces are limited to low hills, where they were created in the 1960s and 1970s in order to make mechanical cultivation possible. Because of mechanical cultivation, their configuration is quite uniform, which especially contributes to the attractive appearance of the landscape. They are still mostly well maintained; however, in recent years terraces in many places have been disappearing through planned changes of terraced vineyards into vertical plantations, which are more profitable.

Terraced landscapes have a clear added value and are an important cultural heritage. This has already been acknowledged by some European countries, which have succeeded in including them on the UNESCO World Heritage List, such as Portugal (the Douro Valley), Spain (the Tramuntana Range), Italy (Cinque Terre), Switzerland (Lavaux), Austria (Wachau), Germany (the Upper Middle Rhine Valley), and Hungary (the Tokaj Wine Region). But this can only come to the force if the terraces are appropriately maintained. Only in this way they can express their attractive image, which should not only be a source of pride for the locals, but can also prove to be an important development potential.

This article offers us some clues on where and how to focus future research. One of the rather new aspects presented here is that of diversity. Diversity itself does not guarantee attractiveness, because this can only be recognized by visiting several such areas, which allows those interested to compare them with one another. The landscape perspective presented in the article may be an added value.

In order to activate this potential, it is necessary to protect the cultural landscape as an important part of Slovenian cultural heritage and ensure sufficiently effective economic and regional development, which may attract more people to terraced areas. Terraced landscapes have important economic potential since they can promote the development of tourism, which ought to market the diversity of Slovenia and its landscapes as its primary destination. In this task, the diversity of Slovenia's terraced landscapes can also be a key element.

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POVZETEK

V članku predstavljamo raznolikost slovenskih terasiranih pokrajin, ki je posledica pestrih naravnih in družbenih razmer, še posebej pa jo je zaznamoval zgodovinski razvoj, ne le v časovno bolj oddaljenih razdobjih, ampak tudi v času korenitih družbenopolitičnih sprememb po drugi svetovni vojni. Na intenzivnost rabe teras v terasiranih pokrajinah pomembno vplivajo sodobne razvojne težnje (industrializacija, urbanizacija, globalizacija), ki jih spremljajo izrazite demografske spremembe, na slovenskem podeželju predvsem deagrarizacija in staranje prebivalstva, pa tudi spremembe v načinu življenja na podeželju in nenazadnje v kmetovanju samem. Raznovrstnost terasiranih pokrajin ponazarjamo na ravni slovenskih pokrajinskih tipov, ki jih predstavljamo z analizo terasiranih območij v izbranih pilotnih naseljih. Poleg temeljih analiz z geoinformacijskimi orodji, izvedenimi tudi na podlagi lidarskih podatkov, predstavljamo raznovrstnost metričnih lastnosti značilnih terasiranih območij, pri čemer izpostavljamo dimenzije teras, njihovih ploskev in brežin, oblikovanost brežin ter preteklo in sodobno rabo tal. Kulturne terase s svojo raznolikostjo oblikujejo značilno kulturno pokrajino kot pomembno kulturno dediščino. Zaradi povezanosti kmetijstva in turizma imajo lahko terasirane pokrajine v globalizirani ekonomiji čedalje večjo dodano vrednost.

Ključne besede: terasirana pokrajina, kulturne terase, raba tal, pokrajinska metrika, Slovenija

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INVESTMENT IN LANDESQUE CAPITAL IN SEMIARID ENVIRONMENTS: DRY-STONE TERRACES IN LES OLUGES (LA SEGARRA, CATALUNYA)

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ABSTRACT

The objective of this paper is to evaluate a methodology to assess the extent and state of conservation of the dry-stone wall terraces in the municipality of Les Oluges (La Segarra, Catalunya) (1915 ha). We described seventy seven 10 x 50 m plots distributed on a grid within the municipality. Stone walls were present in 30% of the sampling plots. The mean length of stone walls was 7.6 m per plot while derelict walls occupied another 7.1 m. Stone walls in agricultural fields appeared deteriorated more frequently than those under non-agricultural use. The standing dry-stone wall network of the terraced system in Les Oluges has, at present, a total length of about 87 km and involves over 144,000 Mg of rock fragments.

Keywords: landesque capital, social metabolism, soil conservation, soil erosion

INVESTIMENTI NEL CAPITALE DEI PAESAGGI ANTROPIZZATI IN ZONE SEMIARIDE: TERRAZZAMENTI SORRETTI DA MURI A SECCO A LES OLUGES (SEGARRA, CATALOGNA)

SINTESI

Lo scopo del presente contributo è esaminare una metodologia per valutare l'estensione e lo stato di conservazione dei terrazzamenti con muri di contenimento in pietra a secco nel comune di Les Oluges (nella comarca di Segarra, Catalogna) (1915 ettari). Sono stati analizzati 77 lotti di dimensioni 10 x 50 m distribuiti su uno schema all'interno del comune. I muri in pietra erano presenti nel 30% dei lotti inclusi nel campionamento. La lunghezza media dei muri in pietra era di 7,6 m per lotto, i muri in rovina ne occupavano altri 7,1 m. I muri in pietra situati nei campi agricoli risultavano deteriorati più spesso di quelli destinati a usi non agricoli. L'attuale rete di muri a secco ancora in piedi nell'ambito del sistema di terrazzamento di Les Oluges ha una lunghezza totale di circa 87 km ed è composta da oltre 144.000 tonnellate di frammenti rocciosi.

Parole chiave: capitale dei paesaggi antropizzati (*landesque capital*), metabolismo sociale, conservazione del suolo, erosione dei suoli

INTRODUCTION

The Mediterranean region includes a high proportion of hill and mountain areas that has produced a historical requirement to invest high amounts of labour and resources in landesque capital (Blaikie, Brookfield, 1987) in order to create relatively flat land surfaces that have been protected through various techniques (e.g., soil bunds, dry-stone terraces) to accommodate agricultural production. A rich biocultural heritage has been passed through centuries, including both material and immaterial structures, that needs to be preserved but which is frequently ignored by European public policies (Agnoletti, 2006, 2014).

This heritage is the result of the dynamic interaction between society and nature, that is, of the social metabolism (Toledo, 2013; Tello et al., 2016), and therefore, change is an inherent characteristic of terraced landscapes (Antrop, 2003; de Réparaz, 2007; Clark, Tsai, 2009). Although there is much debate about how far back in history stone terraces were used (Price, Nixon, 2005), there are certain features, ecologic and socioeconomic, that are common to the dynamics of terraced landscapes. The geomorphological instability that made them necessary in the first place requires a continuous investment in the maintenance of the walls (Blanchemanche, 1990) and is always a threat to their survival (Asins-Velis, 2007; Bevan et al., 2013; Boixadera et al., 2016). The changing socioeconomic conditions of societies have been the driving factors of such dynamics, pushing or pulling the expansion of terraced land (Taradell et al., 1983; Kizos, Koulouri, 2006; Plans, 2007). But poorer peasants, marginalised from the flatter and more accessible land, have been the common predominant actors in the construction of terraces, which in the Mediterranean have historically been linked with vineyard cultivation (de Réparaz, 1990; Olarieta et al., 2008).

The investment in the maintenance of terraces was abandoned to a great extent with the changes in agricultural practices brought about by the Green Revolution mainly by the process of mechanization, as narrow terraces in particular became a burden rather than an asset. The conceptual change from a biophysical to a monetary perception of soils (Naredo, 1987) was the starting point to the neglect of stone wall terraces. The short-term perspective of this perception clashes with the long-term nature of landesque capital, and standard cost-benefit analysis simply cannot capture the rationale behind terraced landscapes (Lumley, 1997; Posthumus, De Graaff, 2005).

The abandonment of terraces is the result of the polarization of land use at all spatial scales in societies with an industrial metabolism (Olarieta, 1994), as marginal and inaccessible areas are abandoned and land use is intensified elsewhere (Olarieta et al., 2008; Cervera et al., 2015). The result is the degradation of landesque capital with frequent increases in soil erosion and a decrease in the capacity of terraces to perform their multiple functions (Koulouri, Giourga, 2007; Lesschen et al., 2008; Arnaez et al., 2011; Stanchi et al., 2012; Agnoletti et al., 2015b).

The stone walls of terraces are also significant elements in the synergies between land and human ac-

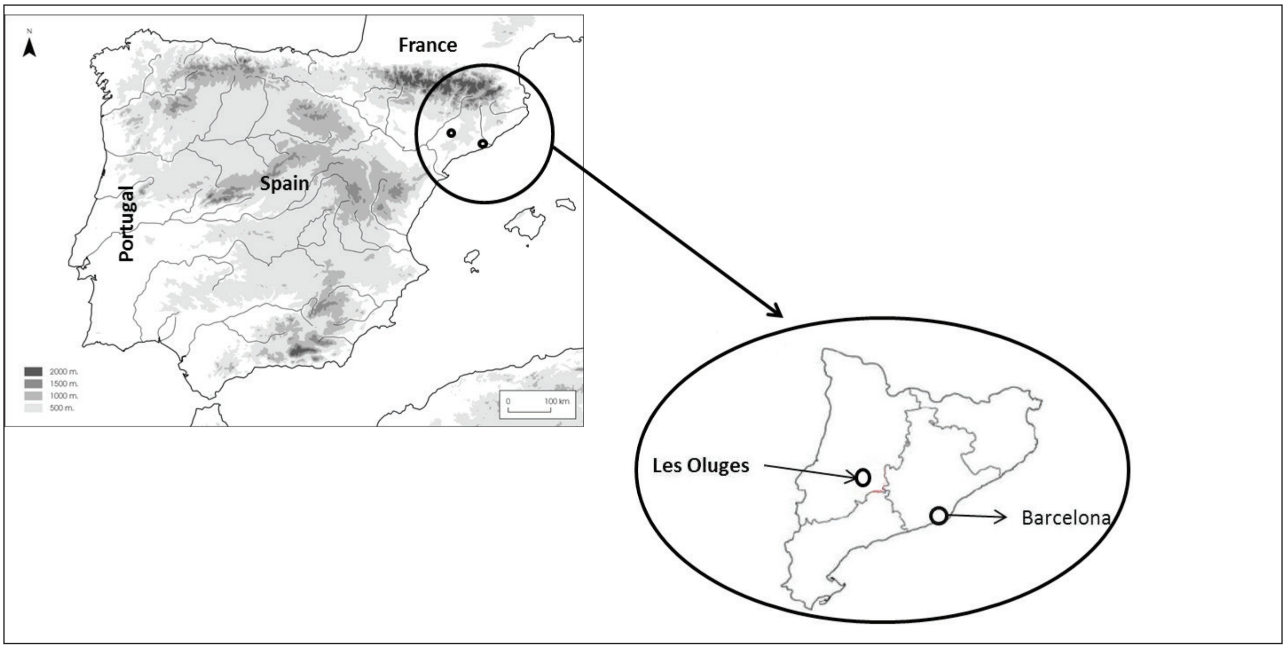


Figure 1: Location of the municipality of Les Oluges within Catalunya and Spain.

tivities. Their role as reservoirs of biological activity (Canyelles, Alomar, 2011) is very important in terms of the beta diversity of agroecosystems (Gliessmann, 2002), and contributes to the performance of agrarian systems with reduced disturbance, and therefore to strategies of 'land sharing' (Fischer et al., 2014; Tscharntke et al., 2012).

Any analysis of terrace systems should therefore include not only the interdependent but different impacts on soils, landscapes, and productive capacity, but also an ethno-historical perspective (Blanchemanche, 1990) that evaluates the labour invested and the social relations that shape them. Neglecting the analysis of agroecosystems as metabolic organisms (Ho, Ulanowicz, 2005) obliterates the past and disregards their future evolution (Antrop, 2005).

The municipality of Les Oluges has a population of 161 inhabitants, and covers 1915 ha in La Segarra (Catalunya, northeastern Spain) (Figure 1) at an altitude between 500 m and 650 m. The area has a semiarid climate, with a mean annual temperature of 13 ºC, a mean annual rainfall of 436 mm, and a mean annual reference evapotranspiration of 810 mm. In geomorphological terms, Les Oluges comprises a set of wide plateaus on limestone that fall along short slopes into the flat valley bottoms of the two streams that run through the municipality (El Sió and La Riera de Vergós). The soils are quite variable in terms of depth, and frequently have less than 50 cm on the flat hilltops while they are deeper than 150 cm on valley bottoms. They are predominantly medium-textured, have an organic matter content in the surface mineral horizon of agricultural fields of 1-2% and over 20% calcium carbonate, and a pH of 8.0-8.5.

Most of the municipality, over 80% of the land, is used for annual rainfed crops, mostly winter barley and wheat, while canola and peas are also introduced in the rotation. Barley yields are 1500 $kg.ha^{-1}$ to 3000 $kg.ha^{-1}$. Almond plantations cover 40 ha, while olive orchards occupy only 3 ha. Forests of various densities cover 200 ha, and 97 ha are covered with shrubs. The dominance of herbaceous crops is a relatively recent occurrence, as data from the late XIX shows these crops covered 35%, while forests occupied 40%, vineyards 21%, and olive orchards only 1% of the municipality (Díez, 2015).

The objective of this paper is to propose a methodology to evaluate the magnitude and conservation state of the dry-stone terrace system in the municipality of Les Oluges (Catalunya, Spain). We hypothesize that stone terraces on abandoned agricultural fields will show a poorer state of preservation than those on fields still being used.

MATERIALS AND METHODS

We studied 77 plots located on the intersections of a 500 x 500 m grid of the municipality. Each plot, 10 x 50 m in size, was located on the field with its centre on the intersection of the grid and the short side following the contour. In each plot we measured the general slope with a clinometer, and described the landform, its shape along and across the contour, and its aspect.

Plots were subdivided into individual fields if there was any change in land use or if human-made modifications of the landform, i.e., soil bunds, dry-stone terraces, or risers, divided the plot. For each field we measured its slope and length, and described its land use and surface dynamics (erosion and/or sedimentation). If soil bunds were present, we measured their height, length, and width, and processes of degradation if present.

For dry-stone walls we measured their height, length, and apparent width, and the difference in height between the surface of the upper field and the top of the wall, and described their vertical and horizontal shape, and pattern of construction. We also described the size and lithology of the rock fragments, and their surface characteristics (e.g., presence of mosses and/or lichens), and estimated the proportion of the surface occupied by empty spaces between the rock fragments. The presence of higher plants on the wall was recorded, and processes of degradation of the wall, if present, were measured.

We estimated the amount of labour required to build the stone wall system considering only a cost of one working day per 3 m^2 of wall but not the preparation activities (de Beauchamp, 1992, cited by du Guerny, Hsu, 2010). The monetary cost was calculated considering the present cost of building a dry-stone wall at 140 $euros.m^{-1}$ (Alava et al., 2009, cited by du Guerny, Hsu, 2010).

All the data were collected in a database, and the R package R (R Development Core Team, 2009) used for statistical analyses. T-tests were used to compare mean values and χ^2 tests to compare the presence of landform modifications on the various landform units, i.e., plateaus, slopes, and valley floors, and on the four main slope aspects, i.e., north, south, east, and west.

RESULTS

Five of the sampling plots (6% of the total) were completely occupied by artificial surfaces (roads, quarries, or farm buildings). In the other plots, 63% of the fields separated by modifications of the landform were used for cereal production, 58% of which were under conventional tillage and 42% under minimum tillage, and 1% for canola. Forests occupied 17% of the fields, and shrublands another 8%.

Sampling plots were mostly located on slopes (62%) and flat hilltops (21%). Among plots located on slopes, the general degree of the slope was significantly higher ($P<0.001$) in plots containing only forests or shrubland (23º, with a maximum of 40º) than in plots which only contained fields with herbaceous crops (10º, with a maximum of 19º).

There was some human-made modification of the landform, i.e., dry-stone terraces, soil bunds, or risers,

Table 1: Main characteristics of the various modifications of the landforms described in Les Oluges

	Plots1	Length2 (m)	Height3 (cm)	Width3 (cm)	Empty spaces3 (%)
Standing stone walls	23	7.6	133 (30-310)	52 (30-100)	11 (5-17)
Derelict stone walls	16	7.1	123 (30-450)	-	-
Risers	17	9.6	490 (40-1500)	-	-

1 : surveyed plots in which the modification is present.
2 : mean values per plot in which the modification is present.
3 : mean values per wall; in parentheses, the range of measured values.

in 37 plots, and stone walls were present in 23 of these (33% of the plots with an agrarian land use) (Table 1). In 7 plots two parallel stone walls were present, in 3 plots there were 3 stone walls, and one plot had a fourth wall. All these landform modifications were significantly more frequent (P=0.04) on slopes (in 62% of the plots on this type of landform) but also appeared on valley bottoms (25% of these plots) and plateaus (38%). They also appeared on all types of slopes, concave, convex, and straight, and did not show a significant preference for any slope aspect (P=0.73), as they appeared on 68% of the north-facing plots and on 50% of the south-facing plots.



Figure 2: Dry-stone wall with derelict segment (on the left) and standing segment (on the right) with three to four different patterns in the structure.

As a result of these modifications the degree of slope of the individual fields on slopes was smaller than that of the general slope previously discussed, so that the mean slope of fields with herbaceous crops located on slopes was significantly smaller (6º, with a maximum of 12º, compared to a mean general slope of 10º) ($P<0.001$) than that of fields with forest or shrubs (21º, compared to a mean general slope of 23º).

The stone walls followed a continuous line along the contour in all cases but one, in which the walls appeared as short segments at different positions throughout the slope. The mean length of the stone walls in the plots in which they were present was 7.6 m (Table 1). The estimated total length of standing dry-stone walls in the municipality of Les Oluges is, therefore, 86,946 m. Another 74,660 m of derelict walls are also present (Figure 2). These figures represent mean terracing intensities of 45.4 $m.ha^{-1}$, or 84.4 $m.ha^{-1}$ if the derelict walls are included.

Each wall was, in general, very homogeneous in terms of architecture. In two cases, the upper layers appeared to be more recent (i.e., with few mosses or lichens covering the rock fragments) than the lower layers of the wall. While most walls were straight vertically and horizontally, in three cases they were at an angle from the vertical following the shape of the slope. In another case, there was a narrow step running horizontally along the middle of the wall. In 19% of the cases the walls were built using outcrops of bedrock (limestone or sandstone) as foundations (Figure 3). The lithology of rock fragments was predominantly limestone, but sandstone fragments made up the lower layers in 8% of the walls. The rock fragments were placed horizontally within the wall, and had mostly a length of 30-50 cm but they reached up to 70-100 cm in either the lower or the upper layers of 25% of the walls surveyed. No completely new walls nor recent works of repair were described in the sampling plots, and no irrigation system was linked to the studied terraces, but two walls showed specific features for water drainage (Figure 3).

Considering their length, height, width, and estimated proportion of empty spaces (Table 1), the stand-



Figure 3: Stone wall built on a limestone outcrop with repaired segment on the left (notice drainage holes) and old segment on the right.

Table 2: Processes of degradation of the stone walls in relation to present land use of the plot (figures represent number of walls in which they appear; in parentheses, mean amount of soil estimated to have been removed by the process).

	Derelict	Disorganized/ bulging	Sheet erosion	Gullies	Mass movements	Piping
Herbaceous crops	10	6	1 (4.5 mm)	1 (4 mm)	4 (0.84 m3)	2 (0.48 m3)
Abandoned	10	3	3 (2 mm)	0	0	0

ing walls in Les Oluges involve 53,517 m^3, or 144,497 Mg of rock fragments. If we consider derelict walls to have similar width and proportion of empty spaces as standing walls, they add 42,500 m^3 or 114,749 Mg of rock fragments. In total, therefore, dry-stone walls in Les Oluges involve 96,000 m^3 or about 259,000 Mg of rock fragments, and would require 10 ha of a one meter-thick rock stratum as raw material.

In terms of labour, and not considering the preparation activities necessary, 38,546 working days would have been required to build the total length of walls, and in financial terms 22,540,000 euros would be required now to build the whole system of walls in Les Oluges.

Processes of degradation of the walls were frequent, including falling over of segments (derelict walls), bulging and disorganization of the structure, sheet and gully



Figure 4: Piping connected to the soil surface behind a stone wall. In the background, valley floor terraces on El Sió floodplain.

erosion of the soil behind the wall, and mass movements and piping in this soil (Table 2) (Figure 4). All processes, except for sheet erosion, were more frequent in plots presently used for agriculture than in those where agriculture has been abandoned more or less recently.

The top of the stone walls was below the surface of the upslope field in 65% of the cases (a mean difference of 57 cm), and only in one case the wall was higher than the field. Furthermore, in three cases soil sediments accumulated at the base of the wall and their volume, considering the size of the field upslope, suggested the erosion of 2-15 mm of soil (Figure 5).

DISCUSSION

The results of our survey showed a higher proportion of fields with forest and shrub vegetation (25% of the fields described within the sample plots) than the proportion of the municipality covered with these types of vegetation (16% of the municipality). Although both figures are not directly comparable, our sampling may have, therefore, underrepresented arable land. Nevertheless, we think it is a reasonable methodology to assess the extent of terrace systems.

The distribution of agricultural fields was clearly limited by the degree of slope. Even though Les Oluges has a rolling, low relief landform pattern, agriculture occupies slopes with an angle up to 19º in which the building of terraces has decreased this angle down to at most 12º. There is, therefore, a preference for placing agricultural fields on more gentle slopes. The limit value of 19º degree of slope is similar to that of 20º obtained by Tsermegas et al. (2011) in the mountainous island of Ikaria (Greece).

The terracing intensity measured in Les Oluges, 84 $m.ha^{-1}$ including derelict walls, is in the lower range of values obtained by Agnoletti et al. (2015a) in Italy, where over 400 $m.ha^{-1}$ have been described. Stone walls, although more frequent on slopes, were present on all types of landforms in Les Oluges. This suggests that creating relatively flat fields was not the sole aim of building the terraces, but also controlling surface water



Figure 5: Stone wall not reaching up to the surface of the upper field. Notice soil sediments accumulated at the base.

flows and/or minimizing processes of soil erosion. The presence of stone walls on flat valley bottoms with water streams, "valley floor terraces" according to the nomenclature proposed by Treacy and Denevan (1994), clearly points at the control of the flash floods periodically produced by these streams.

But most terraces in Les Oluges may be included in the "sloping, dry field terraces" class defined by Treacy and Denevan (1994). No braided nor pocket terraces (Lat. *sensu* Rackham, Moody, 1996) appeared in the sampling plots nor were observed in other sites. The absence of the latter type of terraces is consistent with the minimal importance of olive orchards in the municipality at least since the late XIX century, as those terraces are usually intended to support individual trees (Carbonero, 1984; Kizos, Koulouri, 2006).

In architectural terms, stone walls in Les Oluges were frequently built using rock outcrops as foundations, as has also been reported by Bevan et al. (2013) in Greece, and was encouraged in Les Oluges by the geological structure of the area, which produces rock outcrops more or less following the contour on the slopes. The stone walls of the sampling plots were apparently homogenous, with no obvious differences among the stone layers. But walls made up of various patterns of stones that may indicate different building periods (Tsermegas et al., 2011) were present in other terraces in the municipality (Figure 2). The low frequency of water drainage features, which only appeared in two stone walls (Figure 3), may be related to the relatively low rainfall in the area (436 mm), with short and intense showers of low total amount that produce much runoff but do not saturate the soil. Daily rainfall has only exceeded 50 mm four times in the past nine years, and accumulated rainfall over seven consecutive days has not exceeded 100 mm.

Many cases in the literature (e.g., Lesschen et al., 2008; Arnaez et al., 2011) have shown intense processes of degradation of both the walls and the soil associated after the abandonment of agricultural activities. But in the municipality of Les Oluges this has not been the case and the evolution of the ecosystems after abandonment has been able to check any significant degradation. In fact, degradation processes were more frequently de-



Figure 6: Stone walls built in the 1980s-1990s across a gully.

scribed on fields presently used for agriculture than on abandoned fields (Table 2).

Although no completely new walls were described in the sampling plots, a set of two twenty five meter-long walls made of concrete across a two hundred meter-long gully running through a field was observed outside the sampling plots (Figure 6). These walls were constructed sometime between 1984 and 1995 after the gully was brought into cultivation.

Modern works of repair of the stone walls were frequently observed outside the sampling plots (Figure 3) but not in them. Some walls were being repaired with dry-stone techniques; a few others had been repaired with cement; and in a few cases building garbage, including plastic material, partly filled up the soil behind the wall. Future work should assess these investments in the maintenance of landesque capital. On the other hand, some farmers acknowledge having removed some stone walls in the past in order to produce bigger and continuous fields. Similarly, some risers described in the sample plots, vertical and with a height over 10 m, may be the result of the use of heavy machinery to expand the fields.

The survey consistently showed that the upper level of the stone wall appeared below the level of the surface of the upper plot. We suggest that this may be the result of the maintenance works of the walls not keeping them up to date with the geomorphological evolution of the land surface. A possible reason for this may be the shortage of rock fragments of an adequate size, which do not appear to be frequent in the area any more. In any case, the result is that many of the dry-stone walls in Les Oluges are therefore not performing their function of controlling the overland flow of water from the upper slope, which falls over the wall as a waterfall during heavy rainfall intensity events. This has a double impact. On the one hand, soil erosion increases both on the upslope and on the downslope fields because of the increased energy of the water flow in the event of intense rainfall. And on the other, the waterfall itself



Figure 7: Segment of stone wall on the floodplain of El Sió removed by a waterfall of overland flow produced by the storm of 2nd November 2015 (c. 75 mm in 3 h). Notice the volume excavated by the waterfall at the base of the missing segment of the wall.

may excavate the base of the wall and eventually bring it down (Figure 7).

CONCLUSIONS

Dry-stone terraces are a very significant part of the agrarian landscape in Les Oluges and represent an enormous historical investment in landesque capital with obvious positive effects in terms of soil and water conservation. Degradation processes are more frequent on agricultural fields, and those stone walls that remain in place do not fulfil their hydrological function as the height of the walls is not updated to keep up with the land surface. The dialectics between degradation/removal and conservation of stone walls is falling on the side of the former with the ever-increasing size and power of machinery as the decisive factor. Therefore, institutions should consider the need for active policies to encourage stone wall preservation.

A prerequisite for this purpose is to produce systematic interdisciplinary inventories of these systems that compile their whole range of values. The sampling method proposed provides a reasonable assessment of the terrace system in relation to the effort required, even though some details may not be captured. In any case, the size of the sampling plots should be adapted to the specific location studied.

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NALOŽBA V KRAJINSKI KAPITAL V POLSUHIH OKOLJIH: SUHOZIDNE TERASE V LES OLUGES (LA SEGARRA, KATALONIJA)

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POVZETEK

Gradnja in vzdrževanje terasiranih krajin prestavljata obsežno naložbo v krajinski kapital, ki jo je treba utemeljiti v vsaki družbenopresnovni oceni sistemov kmetovanja. Namen tega prispevka je predlagati metodologijo, s katero bi bilo mogoče oceniti razsežnost in stanje ohranjenosti suhih zidov v terasastih sistemih. Postavili smo hipotezo, da so kamnite terase na zapuščenih kmetijskih površinah slabše ohranjene kot tiste na obdelanih površinah. Pregledali smo kamnite terase v občini Les Oluges (La Segarra, Katalonija) (1915 ha). Vzorce smo vzeli na 77 parcelah velikosti 10 x 50 m, razporejenih v mrežo na območju občine. Kmetijske površine so se pojavljale na pobočjih z do devetnajst stopinjskim naklonom, terase pa so ta naklon zmanjšale na največ 12 stopinj. Suhi zidovi so bili prisotni na 30 % vzorčenih parcel. Povprečna dolžina zidov je bila 7,6 m na parcelo, dodatnih 7,1 m pa so merile zapuščene terase. Propadanje je bilo pogostejše na kmetijskih površinah v rabi kot na terasah, zaraščenih z gozdom in grmičevjem. V 46 % primerov je bila obdelovalna površina za kamnito teraso 20–150 cm višje od vrha terase, zaradi česar je bila hidrološka funkcija terase resno ogrožena. Obstoječa mreža suhih zidov v občini Les Oluges trenutno meri približno 87 km in je sestavljena iz več kot 144.000 ton kamenja. Ta infrastruktura se zaradi različnih groženj, večinoma povezanih s kmetijsko mehanizacijo, kljub vsemu manjša, zato bi bilo treba razviti ustrezne javne politike, da bi jo ohranili.

Ključne besede: krajinski kapital, družbena presnova, konservacija prsti, erozija prsti

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TOWARDS A NEW VALUATION OF CULTURAL TERRACED LANDSCAPES: THE HERITAGE OF TERRACES IN THE CANARY ISLANDS (SPAIN)

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ABSTRACT

The objective of this work is to promote a change in the assessment of cultural landscapes of agricultural terraces on islands where tourism development and the neglect of agriculture have led to changes (territorial, socio-economic, environmental and cultural) to their marginalization, which endanger their conservation. To do so, documents of the instruments for management of protected areas, land and heritage management are analyzed besides the scientific literature, in which various aspects of such cultural landscapes are addressed.

Keywords: agricultural abandonment, cultural terraced landscapes, multifunctional, active conservation, land management

VERSO UNA NUOVA VALUTAZIONE DEI PAESAGGI CULTURALI IN TERRAZZE: ABANCALADO PATRIMONIO DELLE ISOLE CANARIE

SINTESI

Lo scopo di questo lavoro è quello di promuovere un cambiamento nella valutazione dei paesaggi culturali dei terrazzamenti agricoli sulle isole dove lo sviluppo turistico e l'abbandono dell'agricoltura hanno portato a cambiamenti (territoriali, socio-economici, ambientali e culturali) per la loro trascuratezza, che mettono in pericolo la sua conservazione. Per cui, si fa lánalisi dei documenti e Atti di aree protette, la gestione del territorio e del patrimonio, inoltre línformazione scientifica, in cui i vari aspetti di tali paesaggi culturali sono oggetto di discussione.

Parole chiave: abbandono agricolo, paesaggi culturali delle terrazze, multifuncionalitá, conservazione attiva, pianificazione

INTRODUCTION

Terraced agricultural landscapes are the result of a long process of transformation of the natural environment by the societies to face their strong physical limitations (topography, soil, climate) and get the necessary resources for their survival.

Many scientists recognize their multifunctional and sustainable features, at both in their construction (Grove, Rackham, 2001; Tarolli et al., 2014), and also in their past and future management (Scaramellini, 2005; Fagarazzi, 2005; Lasanta et al., 2011, 2013; Romero et al., 2004, 2006, 2015; Romero, 2015; Varotto, 2015; Noriyuki, 2015). Their first role was productive, to provide food and resources to many inhabitants of mountain areas who invested an immeasurable time and effort (human capital). For this reason they are known as the "hunger landscapes" (Gómez, 2007) and the "land hunger" (Martín, 2000); although in many mountains of southern Europe and America they are called the "landscapes of abandonment" (Lasanta et al., 2013). All kinds of agricultural products have been cultivated in them, with high levels of productivity, so agrodiversity and agro-productivity are also among their qualities.

A second function is the environmental one, because they were built to encourage infiltration and water erosion control (water streaming and mass movements) (Fontanari, Patassini, 2008; Tarolli et al., 2014). They are highly efficient infrastructures in water regulation of slopes, waterways, watersheds and aquifers (Arnáez et al., 2015) that, on many occasions, complemented with complex drainage and bypass systems of surface and subcortical runoffs (García and López, 2009), and also in fire prevention (Lourenço, Nave, 2007; Lourenço, Fialho, 2007).

The terraces are also culture elements of cultural identity (cultural function), culture of subsistence, the scarcity of soil, water economy, in short, the culture of necessity. They are territorial documents, pieces of history that tell about the needs of people at different times, which are resolved with different models of terraces (great physiognomic diversity) (Grove, Rackham, 2001; Colomar, 2002; Romero et al., 2003; Kendall and Rodríguez, 2007), where its builders-users have shown a deep understanding of the peculiarities of the terrain and the technique of dry stone masonry[1].

Additional functions that can serve to current social demands may be added to those mentioned above. We may highlight, among others, its use as a tourist resource (productive function) linked to agrotourism, rural tourism, experiential tourism or as heritage resources to be integrated in themed routes; as classrooms or laboratories where research and teaching everything related to these agricultural systems (scientific-educational function); as green filters (swells) for wastewater treatment in poor rural areas (assimilative function) or, for the mitigation of the climate change (Kendall, Den Ouden, 2008) (environmental function).

THE GEOGRAPHICAL FRAMEWORK AND THE STUDY AREA

The Canarian archipelago is a Spanish group of seven volcanic islands located in the eastern Atlantic. It has a surface area of about 7,500 km^2 and, as general physical features, we may highlight its lack of soil and water resources with its limited arable land. The change of the economic model experienced in the second half of the twentieth century has shifted population from agriculture to the tertiary sector (services and tourism) (Figure 1), the abandonment of agriculture and increased the dependence of food from abroad.

Terraced agricultural landscapes are present in all the islands although it occupies larger areas in the most mountainous; La Gomera is the island most widely terraced.

The test of this method is performed in the medium-low segment of the Guiniguada watershed (northeast sector of Gran Canaria) representing a fifth of the basin (Figure 2). Terraced agricultural landscape has, despite its small size, a wide variety of crops and types of walls. The recent history of this area is marked by the agricultural abandonment (50% of the terraced surface) and the island capital city growth that leads to blockage of multifunctionality, loss of visual-aesthetic quality, anti-erosive efficiency and the consequent degradation of landscapes with undoubted heritage value.

TERRACED LANDSCAPES IN THE CANARIAN SCIENTIFIC LITERATURE

Terraced agricultural landscapes of the Canary Islands have been little studied. Although there are many works that deal with agriculture and the rural world, made by geographers, sociologists, economists and historians, a study of their socioeconomic characteristics, types, surface area and problems in the Canaries has not yet been made.

The first contribution made from the *Geography* to the knowledge of the terraces is referred to as the cereal model (Afonso, 1984). This author argues that this was the culture with greater surface area and the one providing the mainstay of the population, through the development of gofio. The existence of terraces at mid-height and summits of the highest and high slope islands is indicated (western and central islands of the Canaries). This author also reports that the peasant has had to broaden the fields occupying the slopes of ravines and

1 Use of the intrinsic properties of dry stone: retaining moisture, moderate but continuous ventilation, thermal inertia with maintenance of temperature (thermoregulatory effect) and effective drainage of soils (Lasanta et al., 2013, 313).

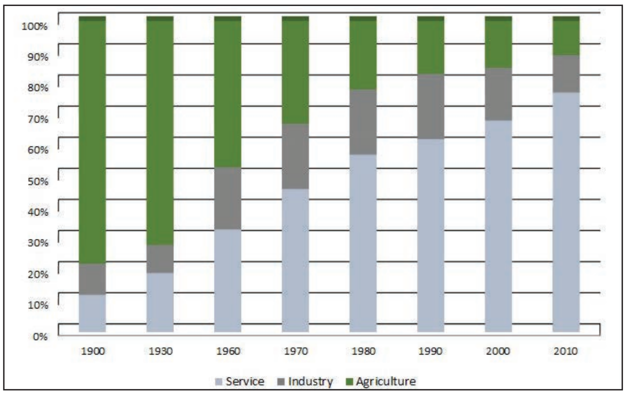


Figure 1. Evolution of the occupied population in the different economic sectors at the Canary Islands (1900-2013). Source: Population censuses and municipal registers. Spanish Statistics National Institute.

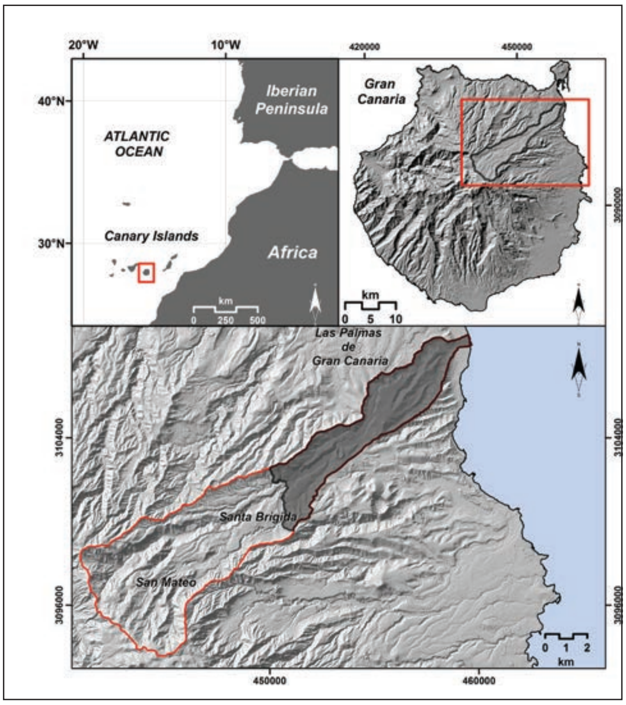


Figure 2. Area of study for the methodological test. Mid-low sector of the Guiniguada watershed (Gran Canaria, Canary Islands, Spain).

marginal areas, thus causing the unique and spectacular scenery of the terraces.

On the other hand, we have the altitudinal geographic model (Álvarez, 1976, 1983 and 1993), which criticized the previous and proposed an explanation of farmland floors, where terraces are preferentially located in the mid-height lands of both the windward and leeward of the island, though without discarding their existence in summits and coasts. This author suggests that terraces are made to reduce the slope and facilitate the irrigation.

Eugenio Burriel (1982), based on the dualistic theories formulated by various development and underdevelopment economists (Amin, 1976) proposes a new explanatory model that distinguishes a rich agriculture from a poor one.

This theory is criticized by Martín and Díaz (1981), who propose a system based on production methods, with a clear Marxist approach model. These authors identify three modes of production in the Canary social formation: the small merchant or pre-capitalist production, the capitalist, and the sub-capitalist.

Rodríguez (1982, 1986 and 2012) analyzes the social and economic problems of the production model of mid-height lands that contrasts, by its technical backwardness and economic marginalization, with the agriculture practiced on the coast.

Instead, Martín (1993 and 2009) makes a typology of agricultural landscapes, using for his classification the following factors: the nature of the cultivated soil, the altitudinal location of crops, the building techniques of agricultural farmland, the form and the size of the plots, the water regime, the cultivation system, the fate of agricultural production and the structure of land ownership.

Finally, among the contributions made by geographers, we highlight the proposal by García and Pestana (2010) who conducted a comparative study of various authors on the concept of mid-height lands. They analyze the mid-height agriculture in the western Canaries and make a particular reference to the technical, economic and social aspects of the rural life in these island areas.

An interesting aspect of the study by García (2011 and 2013) is the abandonment of landscapes associated with many types of agricultural landscapes, among which are those of terraces. He notes that with the outsourcing of the Canarian economy, the "construction boom" and the development of tourism, many plots and farms are abandoned while in other cases a work at full time is changed by another at partial-time. This phenomenon particularly affects terraced landscapes, which start a process of degradation that affects mostly the leeward side of the Islands and in particular at their mid-height lands.

Among the contributions made from the *History*, we may highlight the one by Macías (1981) who reveals the complexity of the traditional agricultural system at mid-height lands (self-supply and internal market) and its linkages with the coastal agriculture (oriented to exportation) through the workforce reserve. He points out, as do many of the geographers cited, that terraces predominate in the mid-height lands.

Finally, it should be noted that from the edaphologic point of view (Fuentes, 2003; Arbelo et al., 2006), studies on the degradation of the terraces after agricultural abandonment have been conducted (erosion and loss of

Table 1: List of* Protected Areas of the Canary Islands *which have the terraced landscapes among their declaration elements.

PROTECTED AREA	ISLAND	REGULATORY PROVISIONS AND OBSERVATIONS
L-9 PP Tenegüime	LZ	Terraces recovery is regulated.
F-12 PP Vallebrón	FV	Ethnographic, cultural and landscape values (ridged reliefs with terraces, very beautiful) are recognized.
C-11 PR del Nublo	GC	Conservation, restoration and new terraces are allowed.
T-20 MN Roque de Jama	TF	New terraces are allowed (with traditional techniques); the restoration is regulated and the maintenance of terraces linked to agricultural use is encouraged.
T-32 PP Ifonche	TF	Restoration and new terraces are regulated. The terraces with dry stone walls and jable deposits are considered as landscape and ethnographic values.
T-35 PP La Resbala	TF	New terraces are allowed (with traditional techniques) and restoration is regulated.
G-4 PR Valle Gran Rey	LG	New terraces are allowed (with traditional techniques), the restoration is regulated and the alteration of the existing terraces is prohibited. The existence of terraces is used as criteria for zoning. The restoration of terraces should be prioritized according to the agricultural landscape and interest of each place. The activities of conservation and restoration of terraces are included in Title 7 of Basic Actions.
G-13 PP Orone	LG	The restoration of terraces is regulated.

Key:
Island: L, Lanzarote; F, Fuerteventura; C, Gran Canaria; T, Tenerife; G, La Gomera.
Type of Protected Area: PP, Protected landscape; PR, Rural Park; MN, Natural Monument. Prepared from the management tools of the respective Protected Natural Areas (ENP).

fertility) and from the physical geography, on the type of the erosion affecting the degradation of these cultural landscapes (Arnáez, Pérez-Chacón, 1986; Romero, 2015). They focus on the environmental and landscape functions of the Canarian terraced landscapes and promote their conservation.

CANARIAN TERRACES: THEIR CONSIDERATION AND TREATMENT IN THE TECHNICAL DOCUMENTS OF SPATIAL PLANNING AND HERITAGE INVENTORY

Through the document review of the management tools and heritage inventories and catalogs, the assessment received by the spaces with terraces in the Canary Islands on the part of public bodies is analyzed.

INSTRUMENTS OF MANAGEMENT OF PROTECTED AREAS

In the Canaries, some kind of arrangement related to the terraces is contemplated in only 69 of the 146 existing protected areas. The mountainous islands (central and western islands) are those that have a larger number of protected areas with terraces. Generally, its restoration is regulated in relation to its landscape relevance and environmental benefits (anti-erosive effectiveness). However, very few documents include the terraced landscape between their protected elements (Table 1) or as basic and priority objectives (Table 2) (Figure 3).

It is frequently observed in the regulation of protected areas that conservation and maintenance of terraces is allowed, the restoration work as authorizable uses are included and new terraces are expressly prohibited. These guidelines, which are repeated on many occasions, particularly appear in the *Rules of Conservation of Natural Monuments*. *Guidelines* allowing "The new exploitation of ancient terraced farmland which are now abandoned" are also common to many documents or maybe those governing its implementation as follows:

- "The height of cut or fill shall be consistent with the existing terraces in the environment".
- "The restoring of walls or containment terraces must always have a rustic stone finished of the environment".

Therefore, it can be concluded that the consideration of the terraces in the management tools of protected areas is scarce, although there is a clear tendency to consider their conservation, as landscape highlighted elements (landscape function), especially in *Protected Landscapes*, and also to understand their anti-erosive effectiveness (environmental function).

Table 2: List of* Protected Areas *that have, among their objectives, the protection of terraces.

PROTECTED AREA	ISLAND	REGULATORY PROVISIONS AND OBSERVACIONS
T-12 PR Anaga	TF	Promoting terracing is an objective of the Plan (art. 9, paragraph 8). Restoration of walls and terraces is regulated (art. 67). New terraces are allowed (with traditional techniques) in area of traditional use and SRPA category (in the terms provided in the Insular Plan of Arrangement). The terraces constitute a criterion for delimitation of homogeneous units. Alteration of existing terraces is prohibited.
T-33 PP Acantilados de La Culata	TF	Maintain terraces as a measure to prevent soil loss and maintain agricultural activity are goals of the Plan (art. 8). New terraces allowed (with traditional techniques), and the restoration of walls and terraces is regulated.
G-9 MN Barranco del Cabrito	LG	Restoration of terraces is regulated.
P-14 PP Barranco de las Angustias	LP	Keep existing agricultural uses and promote the reuse of abandoned terraces are goals of the Plan. New terraces allowed (with traditional techniques) in SRPA. Restoration of walls and terraces is regulated.
P-15 PP Tamancas	LP	Keep existing agricultural uses and promote the reuse of abandoned terraces are goals of the Plan. Although listed as a goal, there is no type of regulation.

Keys:
Island: T, Tenerife; G, La Gomera; P, La Palma.
Type of protected space: PP, Protected landscape; PR, Rural Park; MN, Natural Monument.
SRPA: Rural soil of agrarian protection.
Prepared from the management tools of the respective Protected Natural Areas (ENP).

SPATIAL PLANNING INSTRUMENTS

The Island Management Plans (IMP) highlight among the documents of regional planning instruments that include regulatory provisions regarding the terraces and terracing.

In the IMP of La Palma it is contemplated the need to maintain the existing terraces as protection of soil (art. 35), but without clarifying how to carry out this measure; however, new terraces are regulated (art. 184). In El Hierro, new terraces are allowed using traditional

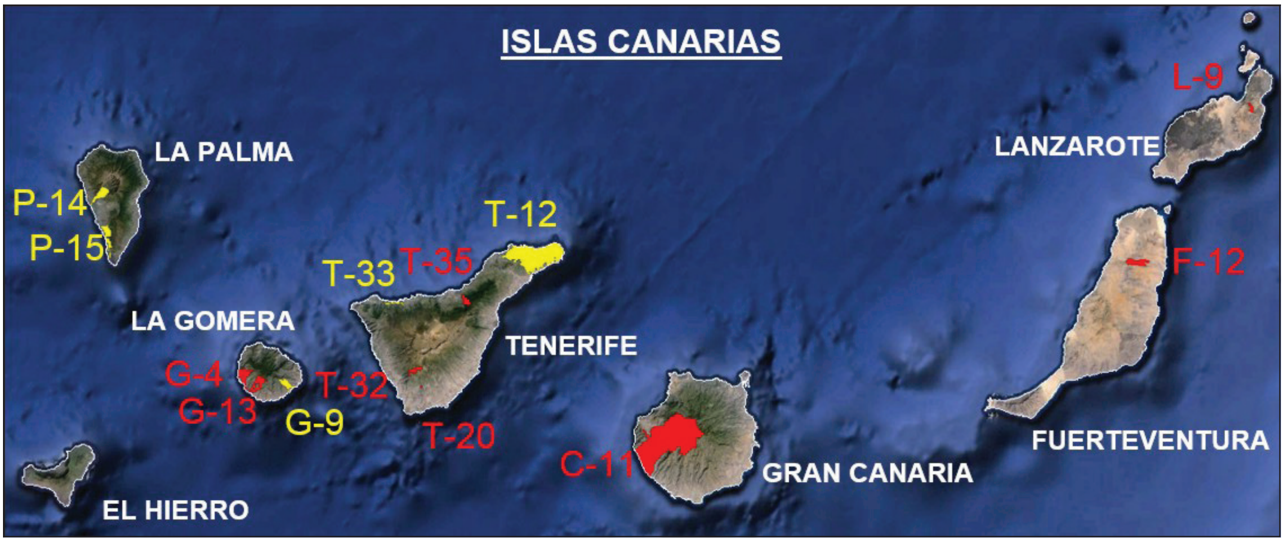


Figure 3:* Protected Natural Areas of the Canary Islands *with references to the terraces on its declaration elements and / or one of its conservation objectives.

techniques, while activities that may alter the existing terraces are prohibited.

In La Gomera island where terraced landscapes have a high ethnographic value, the IMP promotes terraces as a formula for plant recolonization and erosion reduction. It is the only *Insular Plan* that put forward the need to take measures against the abandonment of terraces and restoration of those already abandoned (art. 22). To this end, it proposes a 'program of restoration and maintenance of terraces" and refers to the *Special Territorial Plan for the Agricultural Sector* (AOR-1 PTE-1). This initiative deserves to be highlighted because it is an exceptional event in the Canary Islands and that includes, among its objectives, both the necessary soil retention, such as the protection of traditional landscape, attributing to the terraces, in addition to its environmental value, the ethnographic (cultural) and architectural (landscape). From the heritage point of view, the IMP of La Gomera Island defines the *Island Ethnographic Territorial Areas* (ATIPE) and "Unique Elements", in order to propose measures to protect the ethnographic heritage of terraces through the corresponding *Special Plans*. The fifty four ATIPE considered include the *Island Rural Areas* and "Gomeros hamlets" where the traditional house is understood together with the terraces, as a form of traditional local landscapes and, therefore, as an entity to protect.

The IMP of Tenerife regulates new terraces, limiting them to the traditional areas and provided "to adapt them to the characteristics of the environment" (p. 1.4.2.5., Section 2). In addition, the existing terraces are protected, prohibiting actions that could damage them and the adoption of incentives "for the restoration of terraces" (p. 3.4.2.7); in the end, this regulation do not produce concrete actions.

In the IMP of Gran Canaria, although cultural landscapes are valued in its proposal, no explicit mention is made of those with terraces. New terraces are allowed "in areas where this technique has been traditionally used" and warns to be implemented "in accordance with the arrangement and traditional aesthetic criteria" (art. 161) or by a tree blend (art. 179). This provision suggests that the terraces are considered as a landscape condition, rather than a feature of the landscape with its own value. IMP also presents a regulation to conserve existing terraces to slow the erosive dynamics. One fact that stands out from reading that document is that it is possible to locate tourist facilities on the coast of the northern Gran Canaria, provided that the ancient terraces of banana are preserved (art. 527).

Finally, in the *Island Management Plans* of the eastern islands (Lanzarote and Fuerteventura) the unique mention to the terraces is that terraces can be reused as a property to build housing on rural land (PIOF, art. 97).

In the *Director Plan of action for sustainable development of rural areas in the mid-height lands of the Canary Islands* (2000-2006) there are grants for the recovery of terraced landscapes (BOC-2005/241, Monday December 12, 2005).

As for the territorial and sectoral planning, there are several examples that include landscapes with terraces among its regulatory determinations. It is noteworthy the case for the *Special Territorial Plan for the Landscape of Gran Canaria* (PTE-5) and the Agricultural Special Territorial Plan (PTE-9). In the first one, terraced landscapes are considered as a value to protect, sending any kind of determination to the respective municipal plannings, "recommending" them to allow the terraces. In the second, new terraces are prohibited on hillsides with slopes greater than 30%, or the restoration of those who experience an advanced plant recolonization process; there is no mention to the need to conserve and protect these structures for their productive, cultural or scenic value.

In this section, the island of La Gomera is again the one that, on an institutional level, shows a greater consideration to their heritage of terraces. This is demonstrated by its participation in the cooperation project *Island Agro-Landscapes*, a land stewardship project on tourism and rural islands (2010-2013). It is an initiative of the Association for Rural Development of La Gomera (AIDER La Gomera), which aims to assert the value of traditional agricultural landscapes. It is a pilot project which aims to defend terraces by their huge landscape, economic, ecological and heritage values and it incorporates a new concept of "agricultural custody". This is done by basically testing the commitment of farmers on the island to maintain these structures in good condition, in exchange for incentives and technical advice, and also a reduced financial support. This is, in essence, to experience new ways of compensating them for being the real makers of traditional landscape, since this is an important tourist-productive resource.

Consideration of the terraces in the instruments of spatial planning is scarce, being limited in the best case to prohibit the alteration of existing terraces as relics to be preserved. The construction of new terracing is regulated and limited, which leads us to interpret that terraces almost have more consideration as landscape condition than as a value worthy of protection, conservation and recovery.

C. HERITAGE TECHNICAL DOCUMENTATION

The current *Law on Heritage in the Canary Islands* (BOC No. 141 of July 21, 2006) makes no explicit reference to cultural terraced landscapes, or to them as heritage elements.

In Gran Canaria, the *Special Territorial Plan for the Historical Heritage Management* (PTE-6) is under progress. Although there is still no regulatory document, landscapes considered by the ethnographic value of their terraces, among others, are included in the catalogue of heritage. This documentary is based on the *Plan of the Gran Canaria Ethnographic Catalogue*

(Ramón, 2003), which assigns to the terraces a secondary and complementary value within the ethnographic landscapes, without an explicit mention of relevant meaning; this makes us think that little can be expected from the PTE-6 regarding the future protection of the terraces.

In the case of Tenerife, the production of the island ethnographic catalogue is in its initial phase. The few initiatives undertaken on heritage are at municipal level, as only three municipalities (Granadilla, Guia de Isora and Arona) have a complete inventory of their ethnographic heritage. Beyond the actions of public institutions, the cultural association Pinolere published the only one global project of ethnographic inventory of that island (Hernández, 2011), although terraced landscapes are not included in the list of heritage elements.

References to the heritage of terraces in the smaller islands are very scarce. On the island of La Palma, the council includes only the *Goods of Cultural Interest*, four of which are intangible ethnographic goods, but there is no reference to terraced landscapes. On the island of El Hierro there are not rigorous and comprehensive ethnographic inventories. Their IMP refers to municipalities to produce those inventories and territorial areas of heritage interest are delimited (archaeological and palaeontological, ethnographic and architectural). There is no reference to terraced landscapes as structures of ethnographic interest, beyond making a generic reference to them as "elements of the rural landscape" (section 1.3.3.5 of the volume V of the Informative Report), including the following elements: "stones for protecting the fruit trees, house of shepherds, wineries, eras, ovens, boundary walls of enclosures, etc.".

La Gomera has a small inventory included in the documentation of the IMP, where "singular elements (in ethnographic and architectural interest)", including wells, lighthouses, windmills, davits, warehouses and kilns, are considered. The most important documents are the already mentioned *Ethnographic Island Territorial Areas* (ATIPE) and the *Regional Island Rural Areas* (which includes the "Gomeros Hamlets"), since those are entities that allow for a joint protection of terraces by a *Special Protection Plan* (Article 37.2 of Decree 1/2000).

Fuerteventura has a catalogue of heritage which records a large number of ethnographic goods (ovens, lighthouses, windmills, huts, stores and lime kilns); agricultural landscapes are omitted, highlighting the marginalization of topsails and water harvesting systems, agricultural structures with a great significance on this island.

Finally, Lanzarote has a catalogue for their *Historic-Artistic Heritage* in its current IMP. In this document, little value is given to the ethnographic heritage. It only includes architectural structures (including some mills) and elements of the natural heritage (palms of Haria) but nothing is mentioned regarding agricultural terraces or any other structure (topsails, water harvesting systems and drinking trough).

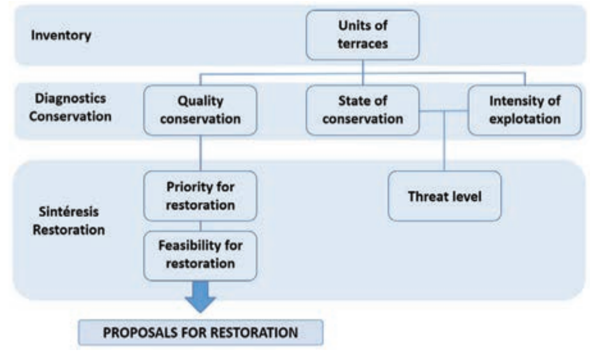


Figure 4: Methodological framework for the assessment of terraced landscapes.

In short, and with respect to the terrace heritage of Canarias, there are few references within the heritage catalogs as elements of ethnographic heritage. We may highlight the inventories of the islands of Gran Canaria and Fuerteventura and to a lesser extent La Gomera and El Hierro. It is very striking that where there are inventories of ethnographic goods, structures with a much smaller footprint than terraced landscapes as pens or house of shepherds are included.

The terraces, as elements of ethnographic heritage and as landscapes, do not have an important role in the heritage conservation policies in the Canary Islands, with the exception of the island of La Gomera where conservation strategies are defined.

METHODOLOGY FOR MULTIFUNCTIONAL VALUATION OF TERRACES. TEST AT GUINIGUADA RAVINE (GRAN CANARIA, CANARY ISLANDS, SPAIN)

The starting premise is that all terraces do not have the same quality and that if the ultimate goal should be to preserve as many of them as possible, a process that is at the same time evaluative and selective must be set, and which contemplates its multifunctional character, its strengths and weaknesses. The method designed for the assessment and recovery proposal is based on the multifunctional nature of terraced landscapes, and it seeks to integrate the various functions (production, environmental, cultural, and aesthetic) in different phases. The method takes place in four stages (Figure 4): i) an inventory of landscape units with terraces, ii) diagnostics for quality conservation and conservation status, iii) priority of preservation before restoration, and iv) a feasibility study for restoration.

The work begins with the identification and location of the landscape units with terraces using aerial photographs and field surveys. These terraces are defined by their use (in operation or abandoned) and by their

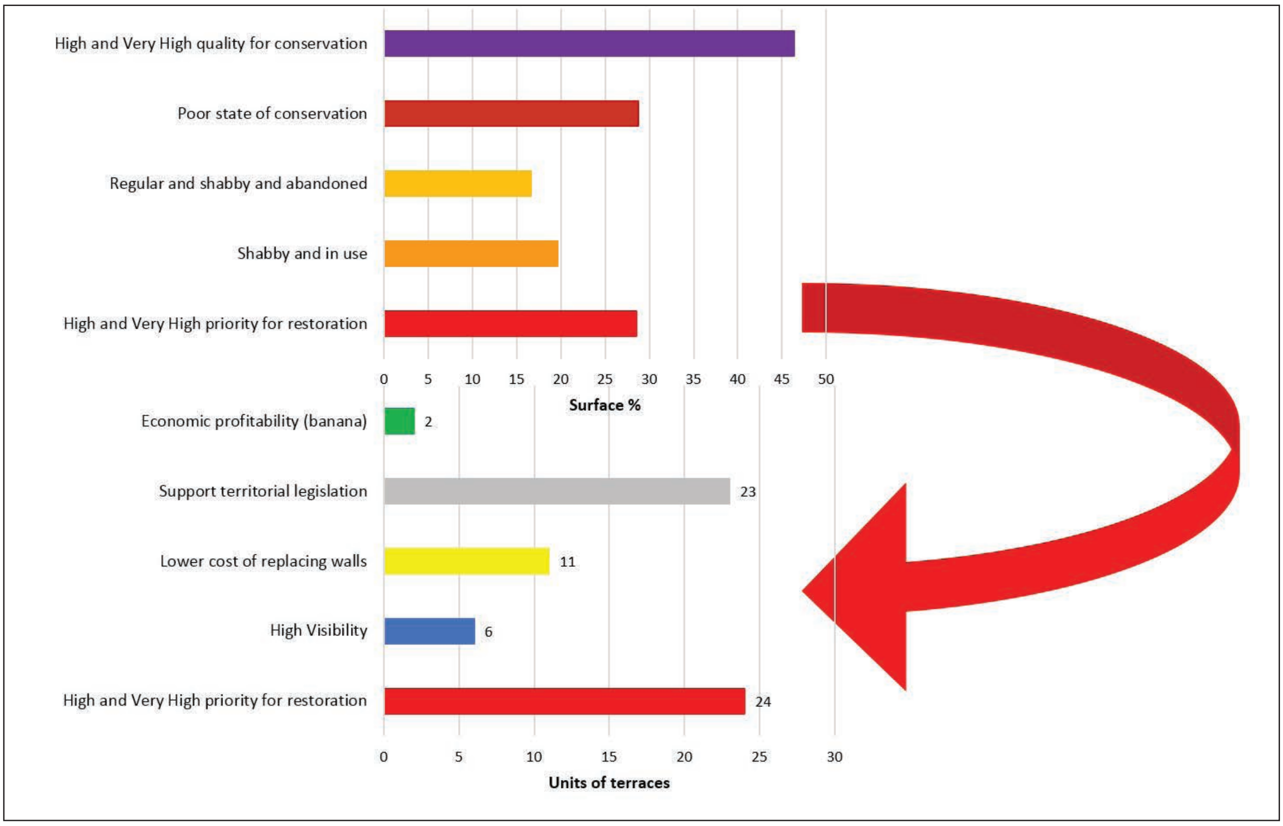


Figure 5: Diagnostic results (quality and conservation status) and* sinteresis *(priority and feasibility for restoration) in the areas of the methodological test.

constructive similarities (type of masonry). The work continues with the design and filling of an inventory record of each unit in which basic characteristics and eco-anthrophic descriptors considered as useful in the later stages of diagnosis and purposeful are included. The digitization of terraced units, the import of the information inventory in a spreadsheet and its implementation in a GIS allow us the processing of data, in addition to the graphic and cartographic output results.

The quality analysis for conservation evaluates the multifunctional terrace units in an integrated manner. For this purpose, an algorithm where the partial assessments of the production function (agricultural quality soil) is introduced, as long as the environmental (regulatory role of the hydrological dynamics of the slope), cultural-environmental (building characteristics is strength—beauty of the walls) and the aesthetic-landscape (visual quality) functions. The last factor added is the level of integration of human activities in terraced units. Five categories are finally obtained, from very low to very high quality for conservation (Romero et al., 2004).

The conservation status analysis provides a diagnosis of the degree of involvement of the terraces to the mass movements of its walls, which are the dominant erosion processes in this type of agricultural structures (falling rocks, landslides and mudslides). The average percentage of walls affected by erosion is evaluated and three categories are established: good, fair and poor condition (Romero et al., 2003).

The priority of preservation before restoration allows the selection of terraced units depending on the urgency of restoration according to the degree of threat (maximum deterioration and in use as a maximum value and well preserved and abandoned, as minimal threat) (Cadiñanos, Meaza, 1998) and its quality for conservation (Romero et al., 2006). The final assessment of the priority is obtained from the product of both parameters (threat x quality), with a previous weighting of quality for conservation (x2) to facilitate the discrimination in similar situations in the degree of threat. Five categories are obtained, from low to very high priority for restoration.

The method ends with the step of applying viability indicators for restoring. The first idea is that the main

2 The intrinsic visibility reports on how much terrace unit is visible for its proximity to villages or roads. Extrinsic expresses how much visibility can be seen about the scenery around the unit (its strategic location is valued for obtaining panoramic views).



Figure 6: Unit nº103 (Finca El Galeón) before and during the execution of the conditioning of the Guiniguada Agricultural Park in Santa Brigida.

goal is the sustainability of terraced areas from their active conservation, with an economic use and the enjoyment by residents and visitors. These proposals are useful if they are implemented in policies or rural development plans, with their corresponding transversal character with sectoral policies in agricultural, environmental, heritage and landscape matters.

Viability criteria are three: visual, economic and territorial. In this phase, the selection is intended for those terraces which bring greater benefit, among those units with high and very high priority for restoration, lower costs and those whose recovery is compatible with the existing territorial legislation. The benefit is calculated from visibility of the terraced units, so the more visible they are, more people can benefit from their contemplation. It is calculated from the intrinsic[2] and extrinsic visibility and their accessibility (Romero et al., 2015). The algorithm considers, as added values, those obtained for the two types of visibility and accessibility, assigning a greater weight to the intrinsic visibility (x2). There are finally three categories of benefit visibility: low, moderate and high.

The economic viability analysis is performed following a double process: first, from the cost of the replacement of the walls at the units selected for their high priority for restoration and, secondly, by calculating cost-benefits of the restoration in relation to the productivity of the two types of dominant cultures in the area: bananas and potatoes. The aim is to calculate the profitability of the restoration (payback time) related to the profitability of these crops, so two separate analyses of economic profitability were consulted. For the territorial viability, documents of different spatial planning tools are reviewed to assess the degree of compatibility of uses and activities allowed in these areas, with the restoration of the walls of the terraces and productive recovery.

RESULTS OF THE APPLICATION OF THE METHODOLOGY OF VALUATION OF THE TERRACES

The results of this methodological test show that 46.3% of the terraced surface has high and very high quality for

3 Unit nº103 (Finca El Galeón), restored by public initiative, is one of them.



Figure 7: Unit nº 103 (Finca El Galeón). Restored and in operation with vegetables in the Guiniguada Agricultural Park in Santa Brigida.

conservation. These units terraces are characterized by the good agricultural quality of their land, the beauty and strength of its walls (row masonry and *rajuela*—unworked and thin stone used in buildings), the highest rating in its hydro-regulatory function (profusely terraced slopes) and, the most outstanding feature, their high visual quality for the important cultural and natural heritage that they contain or are present in their environment (Figure 5).

28% of the terraced surface is in poor condition, with more than 75% of their walls affected by erosion, abandoned between 1960 and 1996 and placed on lithological substrates very waterproof (phonolitic lava) or very brittle (alluvial sediments).

With regards to the urgency of restoration, 28.5% of the terraced surface is high and very high priority for restoration. This is 24 units out of the 111 sampled, which have in common a medium-high quality value for the conservation, and where more than half of their walls were destroyed. Among these, four are the units with very high priority for restoration, which are partly cultivated and their walls are in very poor condition. These were with the maximum quality for conservation due to the natural and ethnographic heritage that exists at both their environment and inside them (palm of *Phoenix canariensis* and hydraulic heritage elements such as dams, ponds, wells, ditches and water splitters). It should be noted that one of them has been restored by the initiative of the Cabildo de Gran Canaria based on indications of the European project *Pilot Urban-Guiniguada* (Romero et al., 2000) and it has become an Agricultural Park (Figures 6 and 7).

The number of units of terraces where restoration would bring the overall maximum social benefit is reduced to 6, 3[3] of which have maximum visibility intrinsic values (proximity to the town of Santa Brigida) and accessibility (busy insular road and the existence of numerous viewpoints where terraces can be viewed from).

The results of the calculation of the replacement cost of the walls of the terraces selected as priority restoration show very high values, ranging from € 9,179.40 for 144.6 meters of wall as the lowest value, and € 212,751.50 for 3350.9 meters of wall as the highest one (Table 3). Those are very high costs, despite the possible existence of institutional support, and are insufficient for being undervalued (the grant would cover a proportion of the actual spending of replacement and further away from the actual price). These costs are highly burdensome for the owner of a farm that practiced a part-time

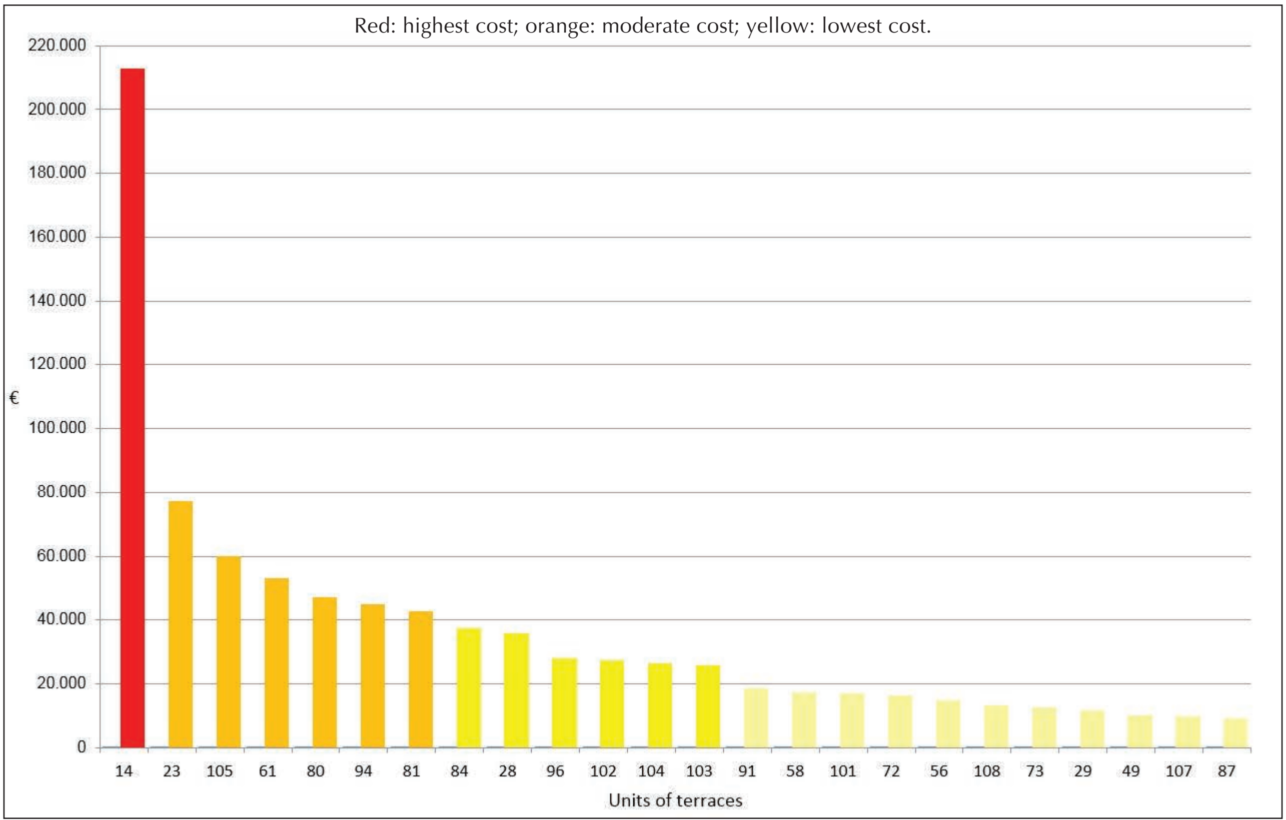


Table 3: Replacement cost of walls at the terracing units with high and very high priority for restoration.

family agriculture, as it is the case for most of the farmers who dedicate their terraces to the dominant crop in this sector of Guiniguada, which is the potato.

The economic viability analysis conducted in terms of "profitability" for the most important crops in the area (potato and banana), shows that, despite both are receiving subsidies for production and marketing, the restoration of the walls to the potato farmers is not feasible, while for the banana it is profitable, despite the fluctuations in its production and marketing.

Finally no "significant" inconsistencies are found between the proposed restoration of the walls of the terraced units with high and very high priority for their restoration and the current territorial legislation.

DISCUSSION

The validity of the designed method for multifunctional valuation of terraces is demonstrated as it has allowed classifying terraced landscapes based on the comprehensive assessment of their functionalities and select a few of them, given their high quality and high priority and viability, to be restored. Its pragmatic nature is demonstrated when one of the terraces units proposed for restoration (Romero et al., 2000) is selected by public institutions to its active conservation as Agricultural Park.

This method can be improved in the future by incorporating criteria for the identification of types of multi-functionalities of the terraces to report on potential uses, for example, following the Japanese model of type of multi-functionalities (Noriyuki, 2015).

This work promotes the multidisciplinary scientific studies and the mainstreaming of sectoral and territorial policies that contribute to the conservation and proper management of terraced landscapes. It is therefore desirable to take advantage of the integrator role or as "mediation" of the terraces (Lasanta et al., 2011; Varotto, 2015) in that they are elements of the landscape and landscapes by themselves, closely related to the conservation of natural resources (soil, water), with the economic production and landscape creating activities, besides being large areas inhabited by a significant number of people.

CONCLUSIONS

The few references found on the terraced landscapes of the Canary Islands legislation on land use planning, natural resources and industry regulations on heritage reflect their marginalization by public institutions that contrast sharply with what is perceived internationally.

It has also been demonstrated little interest of the Canary terraces among scientists. A few references to

them have been found in the field of social and economic sciences, associating them to marginalization, abandonment, a poor family and subsistence agriculture, located in the mid-height lands of the most mountainous islands; these have evolved into a part-time farming and they have also been classified as a single type of canary agricultural landscape. Many of those works are superficial, descriptive and show a skewed view of these landscapes by their authors. Works performed with a physical geography and edaphologic views have focused their interest on some of their environmental sub-functions: the preservation of agricultural soils and the hydro-geomorphologic stability of their slope. In any case, they refer to the true extent and spatial imprint of these terraces or the importance of conservation in relation to the sustainable development of rural areas nor the diversification of tourism Canary Islands.

The methodological test performed for assessing the terraced landscape has shown its abundance, diversity and construction quality that contrasts with their current status of environmental and landscape degradation. This situation stems from agricultural abandonment, the impact caused by poor agricultural practices in many of those still in operation, the development pressure and its suburban character.

K PONOVNI PRESOJI KULTURNIH TERASIRANIH POKRAJIN: DEDIŠČINA TERAS NA KANARSKIH OTOKIH V ŠPANIJI

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POVZETEK

Namen raziskave je spodbuditi spremembe pri ocenjevanju kulturne pokrajine kmetijskih teras na otokih, kjer sta razvoj turizma in opuščanje kmetijstva povzročila spremembe (ozemeljske, družbeno-gospodarske, okoljske in kulturne) in marginalizacijo te dejavnosti, hkrati pa otežujeta njeno ohranjanje. Zato smo analizirali dokumente, instrumente za upravljanje zaščitenih območij, upravljanje zemljišč in nepremičnin ter znanstveno literaturo, ki obravnava različne vidike tovrstnih kulturnih pokrajin. Predstavljena je metodologija vrednotenja, ki temelji na večfunkcionalnosti teh prostorov (produktivni, okoljski, kulturni in estetski). Rezultati kažejo na institucionalno in znanstveno marginalizacijo teh pokrajin na Kanarskih otokih, kar pa je v nasprotju z mednarodnimi težnjami. Predlagana metoda spodbuja aktivno ohranjanje, lahko pa tudi koristi pri uvajanju instrumentov v politiko upravljanja terasastih pokrajin. Predlagana metoda je lahko koristno orodje pri uvedbi aktivnega ohranjanja v politiko upravljanja terasiranih pokrajin.

Ključne besede: opustitev kmetijskih površin, kulturne terasirane pokrajine, večfunkcijski, aktivno ohranjanje, upravljanje zemljišč

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LIST OF ACRONYMS

FAO: Food and Agriculture Organization

ITLA: International Alliance for Terraced Landscapes

ONU: United Nations Organization

PIOF: Insular Management Plan of Fuerteventura

SIPAM: Ingenious Agricultural Heritage Systems World

TKWB: Traditional Knowledge World Bank

UNCCD: United Nations Convention to Combat Desertification

UNESCO: United Nations Educational, Scientific and Cultural Organization

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TERRACED LANDSCAPE AS CULTURAL AND ENVIRONMENTAL HERITAGE AT RISK: AN EXAMPLE FROM PORTOFINO PARK (ITALY)

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ABSTRACT

Man-made terraces represent both a cultural and environmental asset. This important human modification has determined changes in the original balance of geomorphological and geo-hydrological factors, representing a human interference with the geomorphic system. The abandonment of lands, according to altered socioeconomic conditions and climate change determine an increase of erosion and geomorphological risk. Terraces on the slopes of the Bay of San Fruttuoso di Camogli, in Portofino Park (Italy), have been analysed through historical, social and economic research, cartographic and photographic analysis, geomorphological field surveys, meteorological-climatic analyses and modelling of sediment yield with the aim to address management and mitigation of risk.

Keywords: terraced landscape, geomorphological risk, San Fruttuoso di Camogli, Portofino Park, sediment yield

IL PAESAGGIO TERRAZZATO, UN PATRIMONIO CULTURALE E AMBIENTALE A RISCHIO: UN ESEMPIO DAL PARCO DI PORTOFINO (ITALIA)

SINTESI

I terrazzamenti antropici rappresentano un bene culturale e paesaggistico. La loro costruzione è una importante modificazione antropica che ha determinato variazioni degli originali equilibri geomorfologici e idrogeologici. L'abbandono del territorio agricolo a causa delle mutate condizioni socio-economiche e i cambiamenti climatici che si materializzano soprattutto con la variazione del regime delle piogge, determinano l'aumento del dissesto geo-idrologico e del rischio geomorfologico e un conseguente grave impatto sul paesaggio. La presente ricerca riguarda l'analisi dei terrazzamenti lungo i versanti sottesi dalla Baia di San Fruttuoso di Camogli nel Parco di Portofino (Italia). I metodi utilizzati sono consistiti in una ricerca storico-socio-economica, nell'analisi cartografica e fotografica, in rilievi geomorfologici in situ e infine da analisi meteo-climatiche su eventi recenti di pioggia intensa e valutazione del quantitativo di trasporto solido, con lo scopo di fornire un quadro conoscitivo sullo stato dei terrazzamenti ai fini della gestione e della mitigazione del rischio.

Parole chiave: paesaggio terrazzato, rischio geomorfologico, San Fruttuoso di Camogli, Parco di Portofino, trasporto solido

INTRODUCTION

Terraced landscapes testify the intervention of man who, over centuries, learned to adapt and modify areas poorly suited to agriculture. For centuries, and until only 50 years ago, agricultural activity was the main economic occupation supporting the majority of the population. Cultivating the land and making use of its products was the main activity for survival, even in isolated and difficult to tame areas. The terraces of the bay of San Fruttuoso, within the Portofino Park (Liguria), are an example of the way man succeeded in transforming steep slopes overhanging the sea into arable *fasce* (a typical term for Ligurian terraces). Nowadays San Fruttuoso is still an isolated area (Figure 1) and is reachable only on foot along narrow paths, or by sea with boat-service. Terraced landscapes were built following the arrival and settlement of Benedictine monks, who built the Abbey dedicated to San Fruttuoso around the 10th Century. Given the large area of terrain owned by the Abbey, the abbots agreed to allow residents of the village and surrounding areas to cultivate the land as sharecroppers, according to the formula of *emphyteusis,* or long lease. The obligation to improve and maintain the *fondo,* or farming fund, by those working on it, guaranteed that for centuries the terraced landscapes were used to their fullest extent and kept in good conditions. In 1586, the territory surrounding the Abbey was entrusted, through a contract of *emphyteusis* (perpetual lease), first to the De Bernardis family and subsequently to the Roisecco family, until 1900. In 1984 part of the property passed to a regional agency and part to the Italian Environmental Fund (FAI).

The social and economic changes in the second half of the 1900s caused a slow and almost irreversible abandonment of the terraced lands for lack of manpower and absence of local inhabitants. In addition to the social factor of abandonment of the land, a series of geo-hydrological events added to the deterioration or the collapse of many terraces, increasing the vulnerability of San Fruttuoso. The village is located at the confluence of two streams that, in absence of a program of controls of water discharge during of heavy rains, transport a large quantity of debris and mud, especially in the San Fruttuoso village and in the area around the Abbey. History recalls a tragic event on 25 September 1915, when a debris flow, similar to those occurring in Alpine environment, nearly destroyed the ancient Abbey of San Fruttuoso. In that area, significantly nicknamed since that time "Vallone dell'Alluvione", that means "Flood valley", flood events have repeatedly occurred; the most recent happened in 2014, seriously compromising the geomorphological and the agricultural terraced system equilibrium of the San Fruttuoso area. The increase in rainfall intensity, as verified analysing rain gauges data over the last 100 years, tends to foresee an increase in flood events that, considering the steepness of the slopes and the accumulated debris, determine favorable conditions for triggering increasingly disastrous debris and mud flows. The analysis of geomorphological, geological, historical and socio-economic factors have clearly shown that the abandonment of the terraces lead to an increase in hydrogeological risk in an area already struggling to maintain a delicate balance between natural and historical aspects of its landscape.

In fact, terraced landscape constitutes a human interaction with the morphogenetic system that controls the evolution of the relief (Brancucci, Paliaga, 2006): the immobilization of debris and sediments on the slope is made through terraces against gravity action, leaving a characteristic sign on the landscape and testifying ancient settlements. When terraced slopes are abandoned, due to changing social-economic conditions, the lack in maintenance causes the degradation of the dry-stone walls: gravity controls again the dominant processes and the accumulated soil and debris tend to descend at the bottom of the slopes and, for the studied area, in the sea environment. This evolution causes the increase of geomorphological risk, which is already influenced by the modification of the rainfall regime due to climate change. The historical debris flow, often interesting terraces and floods that involved the Bay, caused damages and morphologic modifications.

The park agency, initially established as a conservancy, today is attempting to preserve the delicate equilibrium of San Fruttuoso through a series of incentives for recovering the terraced lands, in order to mitigate geo-hydrological risk.

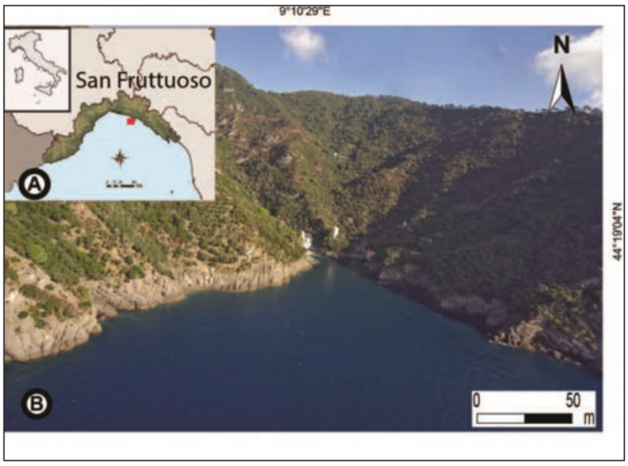


Figure 1: Geographic placement: San Fruttuoso (red rectangle), in Portofino Park in Liguria Region, northwestern Italy (A), San Fruttuoso bay (B). Photo by: A. Girani.

METHODS

The research was performed through cartographic, photographic, historical documents and land use analysis. The direct survey allowed to verify the actual con-

dition of the area, identifying the geomorphological processes on the slopes, while vector and raster layers together with 5m DTM allowed to evaluate the sediment yield with the Gavrilović method (Gavrilović, 1976; Globevnik et al., 2003); for this purpose the land cover layer of the area (scale 1:10000, Regione Liguria – year 2015) and the streams layer (scale 1:10000, Regione Liguria – year 2007), together with geomorphological features and lithology data have been used.

According to the Gavrilović equation (1), the sediment theoretical production in a catchment is controlled by land use, by lithology and by landslides and active erosion areas. Besides the other factors used in the model are the main morphometry parameters of the basin and the climatic characteristic of the area. The former ones have been evaluated from the DTM, while the latter from the weather station on the Mount of Portofino, that is the upper point of one of the two catchments, the Vallone dei Fontanini one. The method makes use of parameters subjectively attributed to the various features related to the erosion factors: this approach makes the methodology a semi-quantitative one.

$$V_s = \zeta * \Theta * h * \pi * \Gamma^{2/3} * A \qquad (1)$$

V_s=mean yearly sediment production (m^3/y)
ζ=reduction factor
Θ=temperature coefficient
h=mean annual rainfall
Γ=relative erosion coefficient,depending on land use, lithology and erosion processes
A=catchement' s surface

DESCRIPTION OF THE RESEARCH AREA

Geomorphological features

Several geomorphological risks, such as coastal erosion, landslides and floods endanger San Fruttuoso and its cultural and natural heritage. The San Fruttuoso Bay area is composed by two hydrographic basins: the Vallone dei Fontanini to the West and the Fosso di San Fruttuoso to the East. The two catchments extend to the crest running between Mount Portofino (609 m) and Mount Bocche (506 m). With a surface of 0,44 and 0,59 km^2respectively (Table 1), their capacity is some 12 m^3/s, with a return time T = 50 years. The mean slopes angle ranging from 50 to 75%, and frequently exceeds 75%; along the cliffs and in a few sections, e.g. in the zone called Buca dei Corvi, it may exceed 100% (figure 2). The hypsometric curves of the two basins (figure 3) shows the dominant tendency of linear erosion, more pronounced in the Vallone dei Fontanini. The bedrock of the San Fruttuoso is made up by Portofino Conglomerates: pebbles are almost entirely constituted by calcareous/limestone and marly shales varying in size from 5 to 50 cm, in thick layers frequently alternating with levels of sandstone which may also contain carbon levels. Underneath, the pebbles is made by sandstone, ophiolites, gneiss, marble and cherts. The matrix is calcareous sandstone with elements of quartz and clay. The layers show a mean dip direction toward south, with dip not exceeding 20° (Giammarino, Messiga, 1969). On a large scale the rock mass shows fractures and tectonic lineations, attributable to direct faults mainly in the direction NW-SE and NE-SW, whose superimposition is cause of the breakup of the rocky mass in blocks which may exceed 10 m. The break up in blocks determine a sizeable circulation of water underground. The geomorphological layout is essentially linked to the effect of the running water, to gravity, to the sea wave action and to man-made activities (figure 4). Along the upper basin of the Fosso di San Fruttuoso and the Vallone dei Fontanini, slopes subject to erosion and deposits left by rainfall are visible, while the circulation of water is mainly underground. In the sections where the riverbed gradient is higher, deposits of gravity induced loose soil are visible. Outwashing phenomena are visible in the areas marked by conglomerate outcropping. Along the cliffs coast those phenomena are clearly visible, exceeding 25 m height above sea level; cliffs are frequently subject to collapse (Figure 5). Among the man-made landforms are the agricultural terraces constructed over centuries, which survive today in the areas known as Caselle and Molini and closed to helicopters base, Torre Doria, and in the sections to the east and to the west of the settlement (Faccini et al., 2008a).

Historical events

The extreme angle of the slopes, the presence of loose soil and phenomena of intense rainfall determine conditions favoring a loosening of debris and mud flow: the basin of San Fruttuoso has historically been subject to these events. The current beach was formed by the geohydrological event of 25 September 1915, which caused the partial destruction of the Abbey complex (Faccini et al., 2009). Archival research has helped establishing that the event was characterized by rainfall exceeding 300 mm in Chiavari and more than 400 mm in the surrounding areas such as Cervara and Santa Margherita Ligure. The information obtained confirmed that on 25 September 1915 the rainfall caused a debris flow that, in form, content and volume, can be compared to typical rainfall phenomena in Alpine settings (Sacchini et al., 2012). The debris flow originated with the collapse of the terraces in the NW sector of the area and subsequently channeled along a tributary orographic right Vallone di Fontanini, nicknamed on that occasion "Flood Valley". The debris fan begins at approximately 10 m a.s.l. and extends to form the border of the current beach: the breadth of the beach was greater at the end of the event and it has been periodically object of beach nourishment. Other important phenomena occurred in 1961, 1963, 1964 and 1995. The latest serious episode took place on 26 July

Table 1: The main morphometric features of the two studied catchments

Catchment	Area (km^2)	Perimeter (km)	Mean steepness (%)	Terraced surface (%)	Hydrographical network length (km)	Main stream length (km)
Vallone dei Fontanini	0,585	3,507	70	2,5	2,825	1,142
Fosso di San Fruttuoso	0,444	2,945	64	9,4	1,953	0,838

2014: the ARPAL rain gauge on Mount of Portofino registered 70 mm of accumulated rainfall/2 hours. The effects on the ground included earth flows along the gully behind the western sector of the inhabited area (behind the building housing the hotel and restaurant called "Giovanni"), at the mouth of the stream on the eastern front of the Bay, under the "Casa dell´Árco" and especially at the end section of the Vallone di San Fruttuoso, where the channel of loose soil damaged parts of the building (Figure 5). Basing on the long time data series of the Chiavari and University of Genoa weather station analysis, the 1915 exceptional precipitation should have a return time longer than 100 years. Nonetheless, the geomorphological characteristics of the basin, in relation to the climatic changes underway, make the statistical approach difficult to reconcile with the actual phenomena. In fact, while the actual rainfall does not show significant changes, the average temperature and the days without rain are showing a positive trend; the subsequent rise in the rate of daily precipitation causes an effect of tropicalization of the rainfall, with a consequent greater probability of triggering landslides and flash floods (Faccini et al., 2008b). This trend is confirmed by recent events in surrounding areas, especially in the last 25-30 years. The multitemporal analysis of cartography and aerial photographs revealed changes in land use linked to abandonment of agricultural activity during the first half of the 20th century (Van der Sluis et al., 2014). This phenomenon contributed to the deterioration of the terraced landscape and the upkeep and repair connected with it and, then, an increase of the geo-hydrological risk. Only in recent times environmental policies have been adopted with the aim of recovering the landscape, in particular through incentives to resettle the original inhabited areas.

The land use in the two catchments (figure 6) shows the dominant presence of woods and bush, typical of the Mediterranean areas; terraces are mainly used for olive cultivation and for vegetables.

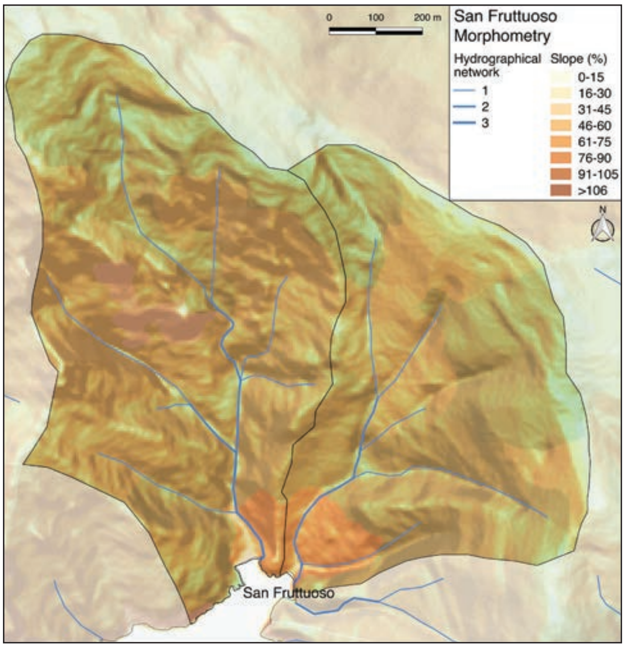


Figure 2: Steepness of slopes map for the two studied catchments.

SOCIAL, ECONOMIC AND HISTORICAL CHARACTERISTICS

San Fruttuoso, in the township of Camogli, lies in the central-southern part of the Portofino Park about 30 km East of Genoa and represents, with Portofino, the most important sector of the protected area since it combines the historical-architectural value of the village with its surrounding naturalistic value, in particular its terraced landscapes. It is bordered by Punta Torretta to the west and Punta Carega to the east - one km apart - and has a

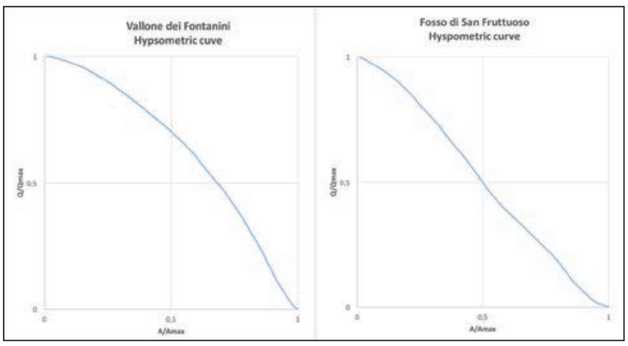


Figure 3: Hypsometric curves of the studied catchments.

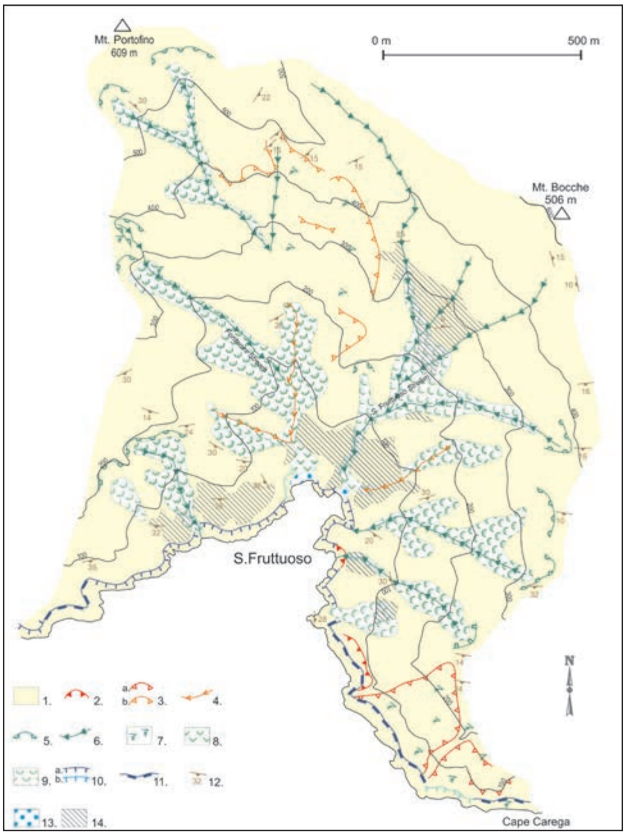


Figure 4: Geomorphological map of San Fruttuoso.

LEGEND:
1) conglomerate
2) landslide scarp due to fall, active
3) landslide or degradational scarp, active (a), inactive (b)
4) rock defile with rock fall, inactive
5) denudational scarp
6) riverbed with trend to downcutting
7) area affected by rill wash
8) debris flow
9) mainly colluvial deposit
10) cliff scarp with height < 25 m, active (a), inactive (b)
11) cliff scarp with height > 25 m, active
12) bed attitude
13) beach (gravel and pebbles)
14) agricultural terraces

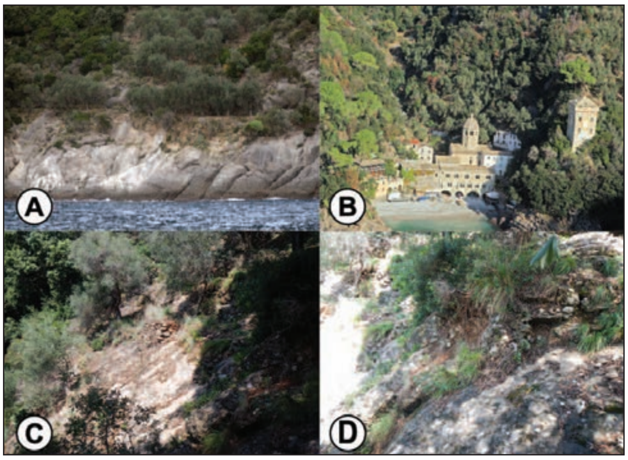


Figure 5: Terraces of olive groves close to the sea (A) San Fruttuoso Abbey, (B) incidents of collapse and other cases of geo-hydrological deterioration such as soil erosion and landslides in the wake of abandonment or poor maintenance of dry-stone walls, (C), (D)
Photo by: A. Girani, F. Faccini.

roughly triangular shape (Faccini et al., 2009). Portofino Park was constituted in 1935, when the first perimeter of the protected area was traced. The area was subsequently extended and newly classified; in 2001 the present perimeter was established. In 1999, the Marine Protected Area of Portofino was established to preserve the underwater environment and its rare species. San Fruttuoso can be considered a Mediterranean example of cultural and natural assets threatened by coastal erosion, gravity-driven phenomena and floods - to mention only the hazards of geomorphological type that affect this area more or less severely - as well as man-made alterations to the land such as terraces. The terraces around the area of San Fruttuoso are among the most characteristic in the park because of their position on the steepest hillsides and their isolation from the rest of the park: in fact, even today terraces are accessible only by land along a footpath, or by sea. San Fruttuoso village extends to two small inlets that are divided by a ridge where the Doria Tower rises (25 m a.s.l., built in 1562). The village's main settlement - where the 10th-Century Benedictine Abbey stands - lies at the end of the Vallone dei Fontanini. A smaller settlement is made up of a few buildings and lies at the easternmost end of the Fosso di San Fruttuoso. The use and cultivation of the terraced lands of San Fruttuoso are linked to the history of the Abbey. The lands were the property of the Benedictine Abbey that developed at the beginning of the 10th Century by Greek monks who had settled in the bay area starting in 711. As a result of legacies and donations, the Abbey's lands became increasingly extended. The earliest documents attesting



Figure 6: Damages due to the recent flood event in 2014 (A), (B), (C)
Photo by: A. Girani, F. Faccini.

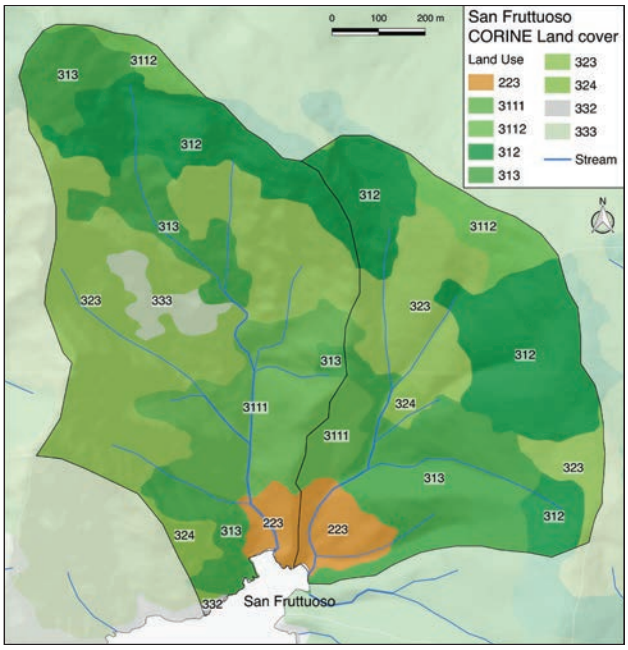


Figure 7: CORINE land cover map of the two studied catchments

LEGEND:
223 olive groves
3111 broad-leaved forest with continuous canopy, not on mire
3112 broad-leaved forest with continuous canopy on mire
312 coniferous forest
313 mixed forest
323 sclerophylious vegetation
324 transitional woodland shrub
332 bare rock
333 sparsely vegetated area

the practice of cultivation on terraced lands date to the mid-13th Century. A mixed cultivation of vineyards, olives, figs and chestnuts was typical of Ligurian agriculture in the Middle Ages in the area around Portofino. A more specialized cultivation of olives is documented beginning in the 15th and 16th centuries through documents citing taxes on oil; in 1535 the Genoese historian Giustiniani described the territory as being rich in orchards and olive groves. The lands were given over for cultivation to the peasant sharecroppers using a system of *emphyteusis*. *Emphyteusis,* from the Latin "to plant, to graft onto"—i.e. a "location for plantation and fruit"—is a property right allowing the use of a piece of land belonging to another, according to which the title-holder (the *emphyteuta*) has the right to full use (*dominio utile*) the land itself, but for his part must improve the land and also pay the landowner (direct or concessionary) an annual rental fee in cash or in produce. The obligation to improve the land's fertility and increase production, required a constant maintenance of the terraces, which remained in good condition up to the middle of the 20th Century. References to terraces built of dry-stone walls are found in documents from 1800 on, whereas earlier terraces more commonly used a system of embankments. The embankments were preferable for allowing livestock to crop grass and bushes, keeping the area clean around the terraces. The dry-stone wall terraces of San Fruttuoso are distinguished by the use of conglomerate of Portofino (Figure 8), comprised almost entirely of limestone-and-marly pebbles. Terraces built on conglomerate have great resistance and durability and consist of elements of sizeable dimensions, sometime several meters in length; this feature indicate a social and territorial organization that was capable of involving a sizeable amount of manpower. The agrarian landscape and the cultivation techniques typical of the area around San Fruttuoso remained relatively unchanged from the Middle Ages to modern times until the 1950s, when a major shift in the uses of the terraced landscape took place as the inhabitants abandoned the most isolated buildings and subsequently the land as well, to move to more accessible areas. The exodus from the terraced areas was the result of changes in social and economic conditions causing entire generations to search for a better and more comfortable life. Low economic returns, years of poor olive harvests, and the effort required to reach the terraced areas and transport their produce were determining factors in this population shift, (Pedroli et al., 2013). In 1999, interviews with farmers in Portofino Park (Mosconi, 2000), revealed the following problems: the average age of the farmers was between 60 and 80 years; they remembered that their own parents had labored under the ancient emphyteutic (sharecropping) system; their children were unable to continue to work the land. In addition, the restrictive rules of the park itself no longer allowed them to keep livestock; the rule, dating back to the 1960s, was aimed



Figure 8: Dry-stone walls in conglomerate:
(A) dry-stone walls in conglomerate mixed to limestone
(B) olive grove
(C), (D) San Fruttuoso's environment and terraces
Photo by: A. Girani.

at modernizing the image of the park in the interests of tourism. According to the locals, the rule increased the difficulty of maintaining the terraces since the animals cropping the greenery had helped control weeds and overgrowth. The increase in the population of wild boar which devastated the cultivated lands and a lack of mills in the area, once abundant and necessary for the production of oil, added to the farmers' difficulties. The park attempted to improve the situation by adopting countermeasures to recover the terraced landscapes, supporting some projects presented by young people such as the cooperative called Il Borgo (Caggiani et al., 2009), which recovered one of the oldest olive groves, planted by the Benedictine monks. The park also invested a consistent sum for the recovery of the dry-stone walls (Balletti, Soppa, 2015). Despite these efforts, the balance of the terraces of San Fruttuoso continues to be at risk, above all because of geo-hydrological events which affect the landscape after heavy and intense rainfall (Brandolini et al., 2006).

RESULTS AND DISCUSSION

Analysis of historical, socio-economic and geomorphologic-environmental data gives clear evidence of the precarious equilibrium of the terraced landscape of San Fruttuoso. For centuries the terraced landscape was maintained thanks to the efforts of monks and peasants who inhabited the territory. A multitemporal comparison of the land use shows how the areas dedicated in particular to the cultivation of olives (a specialized crop) have diminished, starting with the most remote areas and concentrated around scattered buildings and sparse dwellings. This situation calls for a reflection on the implications of lack of maintenance and upkeep of the footpaths which once provided access to such areas, now abandoned and rendered impassable by weeds and overgrowth. The geomorphological characteristics make clear the delicate environmental balance of the area under study. The current terraces are located principally at the confluence of two streams, The Fosso di San Fruttuoso one and the Vallone dei Fontanini; both are susceptible to debris flow. The function of the terraces, which allow water drainage and controlled seepage, is important for reducing the impact of repeated geo-hydrological events. The abandonment of terraces upstream of the bay of San Fruttuoso has led to a decrease in the absorption capacity of terrain now covered by uncontrolled overgrowth, while the quantity of loose soil carried downstream during flood events has increased. Currently the terraced landscape of San Fruttuoso runs the risk of disappearing under a thick layer of wild vegetation and mud from landslides caused by the increasing number of floods. In particular, in the area the main risk is given by the combination of floods and debris and mud flows, whose source is often in the terraces.

More in general the theoretical sediment production in the two catchments, as resulted by the application of Gavrilovic methodology, gives high values (table 2) that are probably mainly due by the morphometry of the catchments, which are characterized by a very high value in mean steepness. It must be underlined that the model asses the maximum possible production of sediment in the catchment, but the values obtained in any case are high. These value highlight the necessity in maintaining terraces in order to reduce important source of sediments that, with the collapse of the structures, may be available to erosion abruptly and then with critical consequences. The influence of a well maintained terraces system may reduce the sediment erosion by about 12-18 times, then with important effects on soil conservation and risk reduction (Bazzoffi, Gardin, 2011).

From a social-economic perspective the advent of mass tourism, mainly day-trippers who arrive by sea, has done little to aid in revitalizing the area. The type of agriculture carried out on the terraces in these inhospitable areas is known as "heroic" cultivation, precisely because of the enormous sacrifice it requires both in terms of transportation and the conditions of life it imposes. Currently, in the zone of San Fruttuoso, activities aimed at recovery of the terraces are carried out exclusively by private homeowners who cultivate as a hobby and by the above-mentioned cooperative, whose core business is tourist hospitality. It is to be hoped that the park will encourage these anthropic efforts through a program of tours and educational excursions to the very heart of the terraced areas, to highlight the importance of this system of cultivation which is so complex and fascinating and is so rooted in the history of the area. Each area has its own terraced landscape which is different from all the others, and this is especially true in Liguria, the region with the greatest number of terraces in Italy. It would be interesting to distinguish every single landscape.

CONCLUSION

Landscape and cultural assets in the studied area seems at risk because of the dynamical evolution of the

Table 2: The result of Gavrilović methodology for theoretical sediment production in the two studied catchments.

Catchment	Sediment production (m^3y^{-1})	Specific Sediment production ($m^3km^{-2}y^{-1}$)
Vallone dei Fontanini	4200	7190
Fosso di San Fruttuoso	2100	4700

slopes, once slow down by the holding action of terraces on the gravity processes; the abandon of maintaining terraces makes the gravity processes rise again and then the degradation proceed. Besides the increase in concentrated rainfall due to climate change, causes an increase of geomorphological risk in the whole area. Then the analysis of the two small catchments facing the San Fruttuoso Bay highlights the necessity of applying urgent management policies to induce the maintaining of terraces in a delicate equilibrium environment.

Recovery policies, carried out by government entities of the territory, could take long-term benefits.

In Italy, an example of functional recovery, is the project called *ADOPTED TERRACING*, where the municipality has decided to give free loans to those who are interested to reuse the abandoned terraces. With this method you will not take the land from its rightful owner, but at least it is done for its reconstitution, and it allows an enthusiast to cultivate and enjoy the fruits of terrace farming. This project have been tested in Brenta Valley (Veneto), where numerous abandoned sites were recovered, and the rebirth of mixed cultivation, such as fruit trees and herbs like mint was witnessed, (Varotto, Lodatti, 2014). In other countries of the world, such in, China and Perù terraced landscapes are preserved and appreciated, through the implementation of "agricultural tourism". In China, in the Yuanyang Hani Rice Terraces, and in Macchu Picchu in Perù, tourists appreciate the beauty of an agricultural landscape.

In Italy, the proindustrial policies of the '60s helped to marginalize the primary sector of agriculture, and to encourage the mass emigration from rural population to the larger towns, so it must be recovered the tourist and socio-economic value of agricultural terraced landscapes. It still remains to further incentivize agriculture, de-tax it, it needs to become a full-time job as the sole source of income. The cost to society will be the funding for the reconstruction of the walls, for the years of the bad growth of crops, but the benefits will be larger, as it will reduce the landslide risk by the work done throughout the country by farmers.

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OGROŽENOST TERASIRANE POKRAJINE KOT KULTURNE IN OKOLJSKE DEDIŠČINE: PRIMER PARKA PORTOFINO V ITALIJI

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POVZETEK

San Fruttuoso di Camogli je starodavno obmorsko naselje na hribovitem območju parka Portofino. Terase so bile edini način za pridobitev ustreznih kmetijskih površin na tako strmem pobočju. Raziskava zajema analizo značilnosti ozemlja in prevladujočih procesov, ki vplivajo nanj. Osredotočena je na obstoj teras in posledice njihovega opuščanja. Na koncu je obravnavano še upravljanje območja: nevzdrževanje antropogenih struktur povečuje odplavljanje gradiva in tako povečuje geomorfološko tveganje. Z neposredno raziskavo smo preučili naravo degradacijskih procesov tako na terasiranih kot na naravnih pobočjih, z zgodovinsko raziskavo pa smo dobili vpogled v začetke tega naselja in njegovih teras. Z Gavrilovićevo metodo smo ocenili teoretično sproščanje gradiva na dveh manjših delih preučevanega območja, rezultate pa ovrednotili v skladu s teoretičnim vplivom teras na odplavljanje. Ohranjanje teras je ključno vodilo politik upravljanja, da bi zmanjšali geomorfološko tveganje.

Ključne besede: terasirana pokrajina, geomorfološko tveganje, San Fruttuoso di Camogli, park Portofino, odplavljanje

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TERRACED LANDSCAPES: NEW DESIGN SOLUTIONS WITHIN THE TRANSFORMATION OF ARTIFICIAL LANDSCAPES

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ABSTRACT

The paper introduces the concept of using artificial landscapes to develop new design principles for sustainable solutions in rural environments in Europe. The introduction defines artificial landscapes in general and gives insight into the potential for permanent transformation of these landscapes. The thesis is that an integral approach that reconciles the existing landscape with the settlement offers a new quality to spatial development. This thesis is explored by comparing two extreme artificial landscapes as case studies: the Dutch polder landscape, reclaimed from the seabed of the North Sea, and the abandoned part of the terraced landscape of the settlement Kojsko in Slovenia's Gorica Hills. The conclusion of this experimental approach is that the potential of an artificial landscape is a key element for the design of more sustainable and self-sufficient solutions, especially in rural areas, which seek a strongly formed identity in a permanent transformation process.

Keywords: terraced landscapes, urban design, artificial landscapes, The Netherlands, Slovenia

PAESAGGI TERRAZZATI: NUOVE SOLUZIONI PROGETTUALI NELL'AMBITO DI TRASFORMAZIONE DI PAESAGGI ARTIFICIALI

SINTESI

Il contributo presenta il concetto di utilizzare paesaggi artificiali per generare nuovi principi progettuali per le soluzioni sostenibili in ambienti rurali d'Europa. Nell'introduzione si definiscono i paesaggi artificiali in generale e se ne evidenzia il potenziale per trasformazioni permanenti. La tesi è che un approccio integrale che riconciliasse il paesaggio esistente con l'insediamento conferirebbe una nuova qualità allo sviluppo territoriale. Questa tesi viene indagata paragonando due paesaggi artificiali estremi come casi di studio: il paesaggio polder olandese recuperato dal fondale marino del Mare del Nord e la zona abbandonata del paesaggio terrazzato dell'insediamento di Kojsko nella parte slovena del Collio. La conclusione di questo approccio sperimentale è che il potenziale di un paesaggio artificiale è l'elemento chiave per la progettazione di soluzioni più sostenibili e autosufficienti, particolarmente in aree rurali, le quali cercano una forte identità nel processo di trasformazione permanente.

Parole chiave: paesaggi terrazzati, progettazione urbana, paesaggi artificiali, Olanda, Slovenia

INTRODUCTION

"Landscapes, like cities, evolve and change over time in response to nature's processes and to human needs" (Lowry, 2005, 11).

If this statement is valid, we humans are also able to actively influence this process of change. It is important to emphasize or study what responsibility human society has in this process, and to determine if we are willing to take it, accept it, and deal with it. As with all physical systems (landscape can be contextualized within the notion of a system when capturing all of its possible aspects), their alteration is a process that involves numerous transformations and constant changes. These have three stages: planning, construction, and decay (Ažman Momirski, 2004).

Natural landscapes

Landscape is "an ambiguous term." It can be defined in a series of definitional overlaps with related but different terms, such as this definition: "Landscape is related to, but not identical with, nature" (Backhaus, Murungi, 2009, 11). In many western European countries, "nature" can only be found in protected reserves nowadays, and so, ironically, sometimes the most polluted areas are protected as "nature." The notion of nature stands for "untouched" (by humans). As Forty puts it (2000, 220), there is a distinction between the world in which man exists – "nature" and the world created by man – "culture."

Artificial landscapes

"The artificial-natural duality has disappeared. Its boundaries have blurred . . . . The landscapes of nature can be as natural (untouched) as artificial . . . . Naturartificial is a new way of designing; a transformation of a concept of place" (Cros, 2003, 63).



Figure 1: "Lepenski Vir is the key site which epitomizes most of the important elements that characterize sequences of occupation across the Mesolithic-Neolithic transition in The Danube Gorges region in the north-central Balkans" (Borić, 2014).

Historically, the first artificial landscapes arose as nomadic peoples settled down (Figure 1). Land reclamation was a necessity of life, too, as a result of settlement processes. Artificial landscapes, settlements, and the architecture within them are a human product and they are part of culture.

The physiognomy and socioeconomic context determined how much and in what way the existing landscape was transformed. The specific character of the landscape in many cases is not only the cause of the configuration of the settlements but also produces the typology and function of the buildings. Buildings, settlements, and landscape were therefore inextricably linked, either as a part of the landscape structure in cultivated and easy modified landscapes, or in contrast to the landscape in extreme and exposed areas.

Transforming artificial landscapes

Industrialization, the resulting population growth, and the onset of suburbanization have severed that link. This process is symptomatic of the foundation of cities but it intensified significantly with the onset of globalization in the 1980s. This decoupling is not only spatially visible but also stems from socioeconomic reasons, because the landscape is no longer the new population's source of economic livelihood. The landscape is transformed into settlements, functional industrial agriculture, nature parks, or tourist areas. It is no longer part of the whole, and degenerates into a backdrop. In Europe the transformation of artificial landscapes is most obviously seen in the transformation into settlements and transformation into functional industrial agriculture, and is as such generally accepted. However, if humanity is indeed able to actively influence this process of change, it could be worthwhile to explore new potential dynamics of landscape transformation, with the aim of getting a grip on how strategic design solutions could contribute to a landscape that is part of the whole again. The identity of a region that is designed in this way, rooted in the built areas as well as in the landscape, has sustainable potential.

The form of the urban landscape

The European landscape is increasingly blending with its urban areas. This phenomenon has been called the "landscaped city" (Germ. *Zwischenstadt*, *der verstädterten Landschaft*, or *der verlandschafteten Stadt*; Sieverts, 1997). Changes to this landscaped city are spontaneous, and they appear to be disorderly, anarchic changes that arise unplanned and result in a geometrically unarranged system. The phenomenon of Zwischenstadt is usually observed from the development of the city. It can also be seen from the development and status of the landscape. This forms the basis of

Sieverts' observation that "the shaping of the landscape where we live can no longer be achieved by the traditional resources of town planning, urban design, and architecture. New ways must be explored, which are as yet unclear" (Sieverts, 2000, 12).

Sieverts emphasizes the instability of the landscaped city or urbanized landscape, in contrast to David Loewenthal, who emphasizes the slow process of landscape change and consequently its stability and security. This perspective relates primarily to landscapes that are listed on the World Heritage List (Cultural Landscapes, 2015). These are cultural landscapes, which are part of our collective identity and protected because they illustrate the evolution of human society and settlement over time.

People used to consider the physical space and environment as more enduring than themselves. This perception builds the impression of permanence and stability because slow, unnoticeable change of the landscape stands as a secure factor of group identity (Kučan, 1999).

Uncontrolled, anarchic spatial changes (like the landscaped city) have at least two characteristic extremes: (1) one resulting when the space is destroyed in a chaotic social situation (as in war); (2) one in which the lack of strategy, order, and spatial order (in an otherwise seemingly orderly society) leads to the transformation of space without a strategy and vision. Natural or social catastrophes compress spatial processes into a narrow time frame: the changes of the 1990s in the Balkans, Beirut, and other war zones generally last for centuries. Spatial development processes become more visible due to wars and natural disasters. Such pathology offers the opportunity to explore the logic of how architecture and urbanism as a transient physical form arise, develop, and disappear (Ažman Momirski, 2004).

On the contrary, the "landscaped city" is an invisible process in the built-up area between the old historical city and the open landscape. The result is something that could be called new living landscapes, man-made landscapes, living topographies (Cros, 2009), and also "artificial landscapes" (Ibelings, 2008). The ways we respond to these artificial landscapes are closely linked to how we look at them.

Of course, this development cannot be halted; but if we want to use the landscape characteristics and qualities in order to reestablish the lost relationship between the landscape and buildings it could be useful to look at it from another point of view. The aim could be to classify the essential spatial qualities of landscape, and to develop the potential of these spatial qualities.

Forms of cultivated landscapes

"While garden architecture has a distinct form, the form of the man-made landscape is inherent in living and working the land. The landscape architectonic form is latently present in the man-made landscape in the interaction between the technical and functional framework and the natural substratum. Unlike in the case of 'architecture and landscape,' the basic form, the spatial form, and the metaphorical form remain latent; they are included in the technology of the layout of the land and in the organization of the program" (Steenbergen, 2008, 13).



Figure 2: View of Haarlem with Bleaching Grounds, around 1670 (Annenberg Learner, 2015). The Museum of Modern Art in Zürich, Jacob van Ruisdael (1628–1682), oil on canvas, 62.5 x 55.2 cm, Prof. Dr. L. Ružička Foundation, 1949.

Landscape providing identity

"Landscape" seems to be an ambiguous term: landscape is related to, but not identical with, the environment; landscapes are related to, but not identical with, places; every landscape is a scene, but "landscape" is not identical to "scenery."

How these landscape scenes can be used to depict the identity of a region can be illustrated with Ruisdael's seventeenth-century painting *View of Haarlem with Bleaching Grounds* (Figure 2). "A blue sky filled with puffy cumulus clouds dominates this painting. Depicted from a raised vantage point, the landscape, occupying the lower third of the canvas, is flat and expansive. In contrast to the large, amorphous clouds above, the land is marked by carefully plotted fields, tidy houses, and detailed greenery. Sky and earth are separated by a nearly straight horizon line, broken only by the towering architecture of St. Bavo's left of center and the silhouette of another smaller church in the distance. Sunlight

touches the clouds as it streams down, illuminating the bleaching field in the landscape's middle ground. Like similar paintings of the period, Ruisdael's painting is not an image of nature unmediated, but of natural resources harnessed for the benefit of civilization. It is an image that speaks to the harmonious, but hard-won relationship between the Dutch and their land" (Annenberg Learner, 2015).

Perhaps the artificial landscape offers more far-reaching potential if it is viewed in a different way. This could lead people to see that landscape could play a role in actual discussions about identity. Nowadays only a few metropolises are still able to determine the identity of a region, and the balance between the core and surrounding areas is shifting more and more towards the outer conurbation area or edge of the open landscape. Therefore, it is necessary to consider if the identity of the built environment could also be created by the outer continuous network of the city and landscape areas.

Identity is a contradictory notion: it means both the condition of being the same or exactly alike; sameness, oneness (for example groups united by identity of interests), and the condition or fact of being a specific person or thing; individuality. Its meaning has a link with the essence, fundamental nature, or most important quality that makes something what it is.

From this point of view, the artificial landscapes in Europe offer new design opportunities to reconcile the landscape with the built structures. The identity of a region that is designed in this way is rooted in the built areas as well as in the landscape, and thus has sustainable potential.

RESEARCH FOCUS

The paper introduces the concept of using artificial landscapes to develop new design principles for sustainable solutions in rural environments in Europe. First, artificial landscapes are defined in general, giving an insight into the potential for the permanent transformation of these landscapes. In order to avoid to falling back on the preset standard solutions provided by modernist design instruments, it is assumed that an integral approach that reconciles the existing landscape with the settlement offers new quality to spatial development. The integral approach makes it possible to strengthen the area's regional characteristics and identities and to combine these in a strategic design.

This thesis is tested by comparing two extreme artificial landscapes as case studies and also simultaneously coming up with new design principles to transform these landscapes. Therefore, it is necessary to choose and explore different types of artificial or constructed landscapes that are diverse in their topographic character as well as in the pace of the dynamic transformation process. These are:

- The polder landscape in the Netherlands,
- The terraced landscape in Slovenia.

The Dutch polder landscape reclaimed from the North Sea seabed and the abandoned part of the pre-alpine landscape of the Gorizia Hills were selected for the artificial landscape case studies because of their characteristic topographies. The pressure on the landscape of the Dutch polder, on the one hand, and the depopulation processes that result in abandoned landscapes in the Gorizia Hills region on the other were also selection factors.

The case study results are presented in such a way as to give better insight into the spatial consequences of the classified design parameters and to focus on the sustainable impact of the thesis. Thus an experiment was implemented in the research model at a specific location in the Gorizia Hills, the settlement Kojsko. The design experiment "New Energy Landscapes" develops different scenarios in the transformation process of landscape and settlements. The determined period of the experiment started in 2012 and ends in 50 years' time, which will also serve to prove the transformation's sustainable impact.

METHODS

"The best way to capture the complexity of landscape as a concept is to look at a particular landscape" (Blackbourn, 2011).

Observation involves looking at and recording the existing setting in a structured way. Various aspects of two selected landscapes are compared in the paper:

- Natural conditions,
- Reasons for existence,
- Artificiality,
- Connecting landscape and settlements / buildings,
- Landscape identity.

With these observations as a foundation, the underlying patterns were brought to light. The correlational approach seeks to document the naturally occurring relationships between the two selected phenomena.

In further steps, to discuss fresh, new views of landscape, the University of Ljubljana and Saxion University of Applied Sciences held two workshops[1] for students to experiment with creating a new relationship between culture and nature. Workshops as a period of discus-

1 Each workshop lasted one week; one workshop took place in the Netherlands and one in Slovenia. The international architectural and urban design workshop "Constructing Landscapes" took place in the Gorizia Hills in October 2011. The purpose of the workshop was to study the landscape dynamics and development of a settlement in the Gorizia Hills and to compare various man-made (or built) landscapes. Architecture students of the University of Ljubljana and urban design students of the Saxion University of Applied Sciences worked closely together, and were given feedback by teachers and professionals. Excursions and lectures were part of the program. Scenarios for the future development of the Gorizia Hills were designed within five working groups.

sion, which emphasized the exchange of ideas and the demonstration and application of knowledge and skills, were used as a research method. This method was meant to stimulate the establishment of innovative design solutions and exchange of ideas. The workshop was used as a dynamic community, generating new designs through guided exercises and assignments. During the first workshop students analyzed several Dutch artificial landscapes, in order to learn about the relationship between nature and buildings, or culture, in the relevant areas. The focus was on the spatial relationships, not the functional relationships. In the second workshop, the students created a design for the Gorizia Hills. The assignment was designed to give insight into the spatial relationship between nature and culture in this area, and to enhance this relationship through a strategic design.

ARTIFICIAL LANDSCAPES IN THE NETHERLANDS AND ARTIFICIAL/TERRACED LANDSCAPES IN SLOVENIA

Case study one: Artificial landscapes in the Netherlands

The Dutch landscape was used to illustrate that recognizing the artificiality of the landscape can lead to a sustainable design, in which buildings and landscape are connected and create an identity together.

"The Netherlands are not only almost entirely built landscapes … the awareness of the artificiality of any spatial operation is part of a collective consciousness and is deeply rooted in the mentality of the designers of this artificiality. In Dutch architecture, urbanism and landscape architecture sounds self-conscious because it is the foundation of the national myth of the heroic struggle against the water. The idea that this country is not a natural phenomenon, but exists because of human ingenuity and technology to implement water management, by working at various levels. The note of artificiality stimulates the creativity of designers, who are not bound to consider proposed restrictions on what can and cannot take place. This provides the space in the Netherlands to imagine the inconceivable and to think the unthinkable. Since the Netherlands largely consists of polders and even the most natural-looking landscapes are manmade or have at least been cultivated and maintained, nature and culture here, even less than elsewhere, are mutually exclusive components"(Ibelings: 2000, 10).

Nagele, a polder village, a new village on a new land, is an example of this description (Figure 3).

The Netherlands has an area of 41,528 km², of which seventy percent is situated below sea level. It has about 16,515,057 inhabitants and its population density is 397.7 inhabitants/km².

The Netherlands has always been forced to be creative with the space that was suitable for building. The country is largely artificially drained (polders) and the

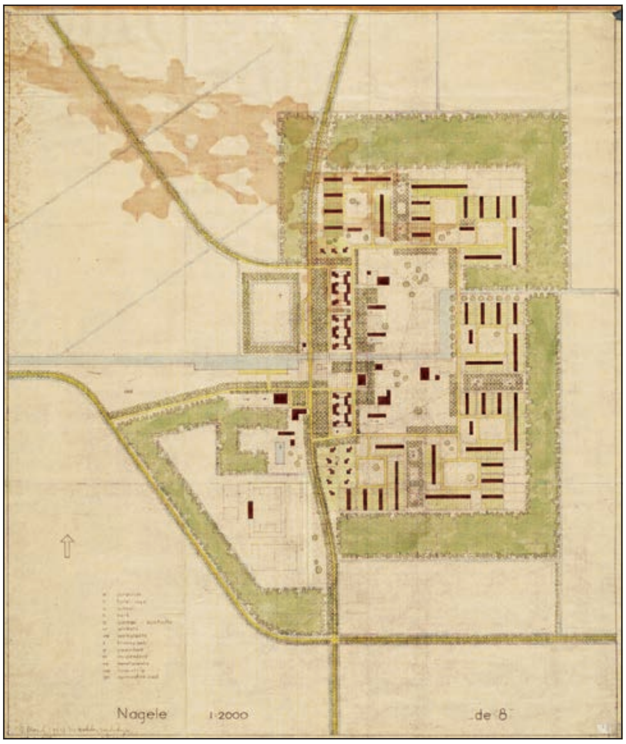


Figure 3: Urban design of the polder village Nagele, 1954 (Aldo van Eyck i.s.m. De 8 and Opbouw). The Noordoostpolder (northeast polder) was the second polder after Wieringermeer to be created as part of the Zuiderzee Works. Both combine functional hydraulic engineering and agricultural frames of reference with traditional ideas on planning and landscape. M.J. Granpré Molière was involved in parceling the polder landscape. Noordoostpolder was laid out between 1936 and 1942. Most of the villages, among ten built between 1949 and 1956, were designed by the architectural section of the Wieringermeer management of the traditional Delft School. Only Nagele was claimed by the modernist architects and urbanists of the Amsterdam functionalist circle De 8.

sea is kept out with great technical ingenuity (dikes). It was essential to design carefully within the new landscape; there were several reasons this artificial landscape could not be disregarded when it came to arranging it with buildings. First, the technical reason for this was that the seabed was not strong enough to build on in every area equally. The appropriate spots had to be determined carefully, whereby the potential fertility of farmland also had to be taken into account. The second reason, which was unforeseen at the time the polders were reclaimed, was the power of the elements of nature. What was underestimated, for example, is that there is a difference between the climate at sea and the climate on land, and that therefore a seabed was not automatically fit to inhabit. The new land was so bar-



Figure 4: Zaanse Schans, the Netherlands (Cris Toala Olivares).

ren and vast that the pioneers often went literally insane because of the hard, continuous wind. Therefore it was necessary to plant trees and carefully construct windbreaks and hedgerows around the heirs and villages. This proved that the newly created artificial landscape had to be transformed even more before it was even habitable. Buildings and artificial landscape in the Netherlands are inextricably linked. Urban design and landscape architecture are essential disciplines in the Netherlands, not a luxury.

Yet the Netherlands succeeded in attaching their identity to the landscape. For example, traditional postcards from Holland show tulip fields, windmills, and dikes (Figure 4). All these elements are part of the transformed, artificial landscape. The windmills were used to regulate the water level in the polders, the dikes prevented the water from coming in, and the wide colorful tulip fields represent agriculture in the polders.

Case 2: The terraced landscapes of Slovenia

Slovenia has exceptionally diverse landscapes in a small territory of 20,273 km², which is inhabited by 2,063,371 people. Its wealth of diversity also results from the fact that Slovenia lies at the intersection of four major European regions (the Alpine, Pannonian, Dinaric, and Mediterranean regions) and four different cultural spaces (German, Romance, Hungarian, and Slavic). This variety and the transitional nature of Slovenia's regions constitute its main geographic characteristic and are important elements of its identity. Slovenia does not have a terrain favorable for settlement and the population density of Slovenia is 101.8 inhabitants/km². Urban areas in Slovenia cover less than five percent of its land. The capital, Ljubljana, is the only Slovenian city with a population of over 100,000 inhabitants (Statistični urad, 2016). The major part of Slovenian territory is woods (about three fifths of the territory), the rest is cultural landscape (over one third of the territory). The plains, fields, basins, and valleys have slope inclinations between 0° and 2°, which accounts for 14.3% of the territory (Perko, 2001, 113). The rest of the territory has a hilly configuration that required the settlers, who were more aware of their direct dependence on nature in the past, to adapt to it, acquired the knowledge and experience to grow their crops on the sides of hills or mountains by planting on graduated level areas built into the slope. Farmers were particularly careful to retain and maintain their fertile soil. Terraces maximized arable land in variable terrains and for different cultures, reducing soil erosion and water loss at the same time. These terraces made it possible to create appropriate growing conditions for cultivating fruit trees and grapevines, and to produce high quality crops.

Slovenia's Spatial Development Strategy (OdSPRS (2004) defines agriculture as the main guardian of its cultural landscape. Terraced landscapes represent a hidden concern for land cultivation and a long-standing commitment that is transmitted from one generation to



Figure 5: Constructed terraced landscape in Jeruzalem (Matevž Lenarčič). In the Slovenian Hills after the Second World War the land was taken over by state-owned companies, which were faced with the fact that 70% of the vineyards needed renovation. The first terrace plantations appeared and the vineyard landscape began to change character after 1957 (Belec 1968). Terrace plantations made mechanized work possible, thus decreasing manual labor, reducing processing costs, allowing for higher quality grapes, and reducing soil erosion and land movement to a minimum. Terrace renovation carried out in the national, public, or social sector encompassed 80 to 90% of all areas (Simonič, 2014).

another. A quality cultural landscape is becoming one of Slovenia's principal values and comparative advantages (Ažman Momirski, 2008, 115). Terraced areas, which form a part of the cultural landscapes in Slovenia, are built and constructed landscapes (Ažman Momirski et al., 2007; Ažman Momirski, Kladnik, 2008, 2009, 2015), which can be found in more than 90% of municipalities in Slovenia, covering a little less than 97% of the territory of Slovenia.

Terraced landscapes are complex systems composed of various subsystems including water management, biodiversity, land stability, agricultural systems, and so on. These features or subsystems are interdependent and they are very delicately balanced. Terraces can be divided according to agricultural use. Probably the oldest terraced slopes in Slovenia were agricultural, both for the cultivation of crops and pastures, but later on farmers also cultivated grapevines, fruit trees, and olive trees there. Various forms of terraces were built, taking into account natural conditions such as climate and terrain, and different agricultural purposes, with variations of terrace platforms and terrace slopes. These can vary even within the same settlement area, particularly after the second half of the twentieth century. Prior to this, the terraces were built by hand and the construction of terraces was a labor-intensive job, which the community usually performed together. The use of construction and agricultural machinery has changed the modes of terrace production and construction terraces, and consequently the image of the terraced landscape. Some of the most beautiful terraced landscapes in Slovenia emerged only after the 1960s (Figure 5).

It is not always possible to identify the relationship between settlements and the terraced landscape when terraces cover slopes from the bottom to the top of the hill. This relationship is more readable where the cultural landscape is well overgrown by the forest. There, the mostly abandoned agricultural land is more distant from



Figure 6: In the settlement Kožbana most of the agricultural land, which is overgrown with trees today, was abandoned in the second half of the twentieth and the beginning of the twenty-first centuries, because many people moved out of the village. Inhabitants mostly cultivate smaller plots of land for self-subsistence (Lučka Ažman Momirski).

the settlements and the terraced landscape remains only in the immediate vicinity of villages, where it draws attention to the integration of arable land and settlements (Figure 6).

In parallel with the identity of Slovenia's landscape, typical agricultural products have contributed to regions' visibility and identity traditionally, and still do so today.

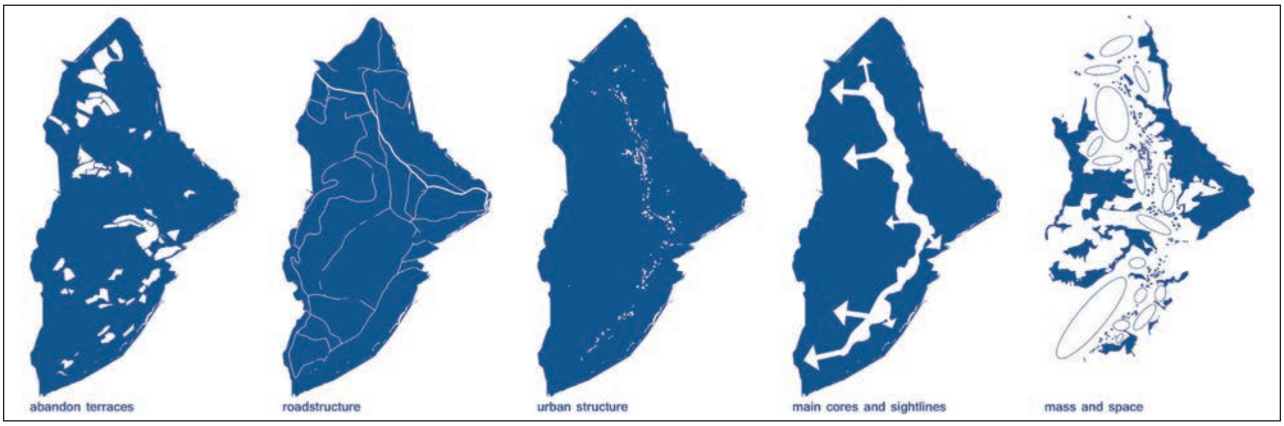


Figure 7: Analysis of Kojsko (Ruud van der Maas).

DISCUSSION: DESIGN POTENTIAL IN TERRACED LANDSCAPE OF THE GORIZIA HILLS

Careful observation of the transformation processes in the Gorizia Hills shows that the cultivated landscapes transform continuously for various reasons: changes in terrace construction, the change from manual to mechanized cultivation, land abandonment, changes in the choice of crops planted on terraced platforms, and so on.

In the well-developed southern part of the Gorizia Hills the comparative proximity of the agglomeration Manzano / Cormons / Gorizia / Nova Gorica provides economic prosperity. Traditional suburbanization processes and the construction of new terraces for the vineyards lead to an ever more cultivated landscape, in which the historical image of the landscape is changed new construction approaches and new forms of cultivation. In the less developed, thickly wooded northern part of the Gorizia Hills the villages are shrinking (one of the villages, Slapnik, is a place where no one lives anymore) and the abandoned terraces will gradually become overgrown.

In both cases the rural patterns of life are also facing a structural change, not just the settlements themselves. The use of the agricultural land is changing, leading to the decline of the rural village culture. The traditional community of a working population engaged in agriculture is decreasing. Historically the rural settlements were based on this community, which guaranteed the inhabitants' survival and stability. While the elderly working population engaged in agriculture is dying out, the majority of inhabitants are generating increasingly larger proportions of their income as commuters to the nearby metropolitan areas. These metropolitan areas offer the jobs and education that young people are looking for.

It is impossible to stop these transformation processes. But maybe it is worth rethinking our perspective on how to closely look at and analyze these landscapes. Considering that the real-life world of new residents is largely decoupled from the landscape, it seems rather naive to proclaim a new perspective on the cultivated landscape and assume that we can use these urban sprawl processes and the disintegration of the villages to create a new settlement and landscape entity. Of course, we do not want to propagate a panacea for urban sprawl and rural migration. But what if we experiment, what if we sincerely try to use these originally contrasting processes to strengthen the characteristics of this region, instead of complaining about the consequences of the transformation and surrendering to them? What if it is possible that a new perspective on landscape could help to suspend the contrast of landscape and settlements? Then we would be able to consider new concepts in which the dynamics of region are taken into account and sustainable development is possible.

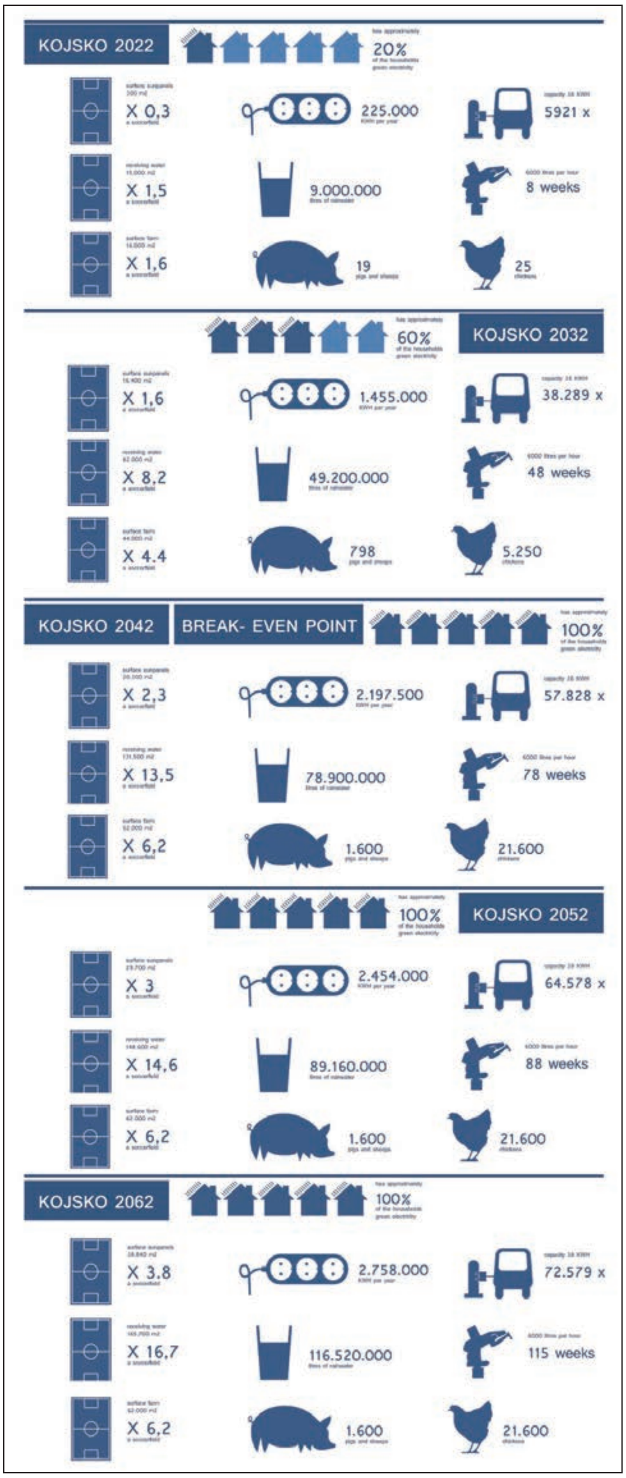


Figure 8: Gradual strategy of the Kojsko "New Energy Landscape" (Ruud van der Maas).

"New Energy Landscapes" Experiment (Ruud van der Maas, 2011)

In his student project "New Energy Landscapes," Ruud van der Maas developed a strategy for Kojsko (in



Figure 9: Ground plan of "New Energy Landscapes" (Ruud van der Maas).

the Gorizia Hills) to become a self-supporting village by 2062. Kojsko, which was the economic and cultural center of Brda before the First World War, today has around 300 inhabitants and the character of a peripheral village. Five features stand out in the analysis of Kojsko (Figure 7): abandoned terraces that reflect social and other changes; accessibility, which is very good in part of the village because the main road runs through it between Dobrovo (the modern center of the municipality of Brda) and Nova Gorica; a settlement structure concentrated along the ridge; nodes and stunning views; and land areas where it is possible to carry out spatial interventions.

A gradual strategy is used to integrate this new energy and sustainable landscape into the existing terraced landscapes (Figure 8). The chronologically developed scenarios provide insight into the standard of self-supply. According to the planned steps Kojsko will be independent in energy, food supply, and transportation by 2042 and will produce a surplus starting in 2014. This surplus can be used to develop new energy landscapes on other abandoned terraces, based on the Kojsko case study. The strategy takes into account that assessing resources will be of fundamental importance for humans in the future. The growing world population requires increased agricultural production and energy, which will in turn affect water and land resources.

A new farm building is designed in the abandoned terraces of former vineyards (Figure 9). The shape and the location of the new building is partly influenced by the living requirements of a self-supporting village (with focus in this case on three aspects: energy, food supply, and transportation). The project identifies the current qualities of abandoned terraces, and subsequently develops and proposes new connections or the development of connections between the deteriorating

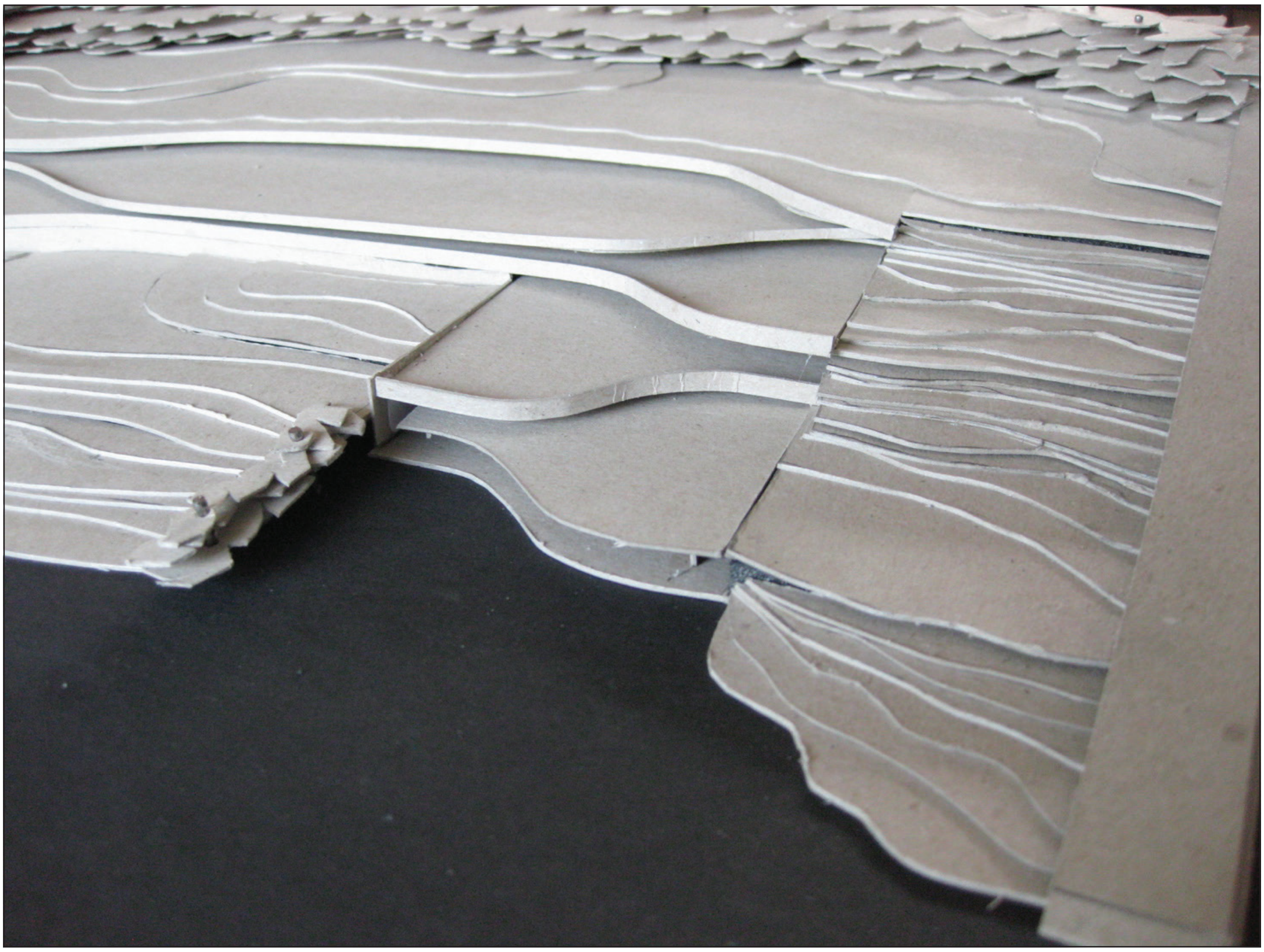


Figure 10: Model of "New Energy Landscapes" (Ruud van der Maas).

landscape pattern and the existing built structure of the terraced landscape (Figure 10). The design is based on including high-tech architecture with the application of local energy resources (mainly solar panels and new hydrogen technology) and simultaneously meeting requirements for food self-sufficiency in individual settlements. The solution relies on the consideration that smart, resource-efficient technologies, well adapted to the location and inhabitants' needs, can significantly reduce the use of inputs as well as emissions.

CONCLUSION

The discussion reflects on the experimental results in order to reach more specific conclusions. The experimental approach clarifies that there is a synergy of different tools that are able to strengthen each other if the process of transformation is guided by the landscape. Small-scale solutions allow the integration of self-sufficient communities as well as regional approaches of "New Energy Landscapes." The specific design solutions are able to react flexibly to the users' needs and form a counterpart to the generic approach of standard design solutions. Although the published design results are still too superficial, the experiment gives clear insight that the defined design instruments offer a huge range of resilient design solutions. It seems worthwhile to develop this experiment further and to achieve more elaborated solutions. We suggest continuing the project with a multidisciplinary team in order to optimize a sustainable transformation by using the spatial characteristics of the artificial landscape.

Design strategies instead of masterplans

The goal of a sustainable urban development plan should be to anticipate and respond to different developments adequately.

Traditional urban master plans assume an ideal end state. In practice it is almost always necessary to adapt these master plans at some point. A fixed master plan as an end result can easily lead to "trouble areas," whereas designs open to future, unpredictable developments could make it possible to align quality and user needs

on an ongoing basis. Being able to design for flexibility and impermanence is one of the hardest – and yet most important – challenges for an urban designer. Urban Nomads aims to explore the potentials of dynamics of change, in order to get a grip on how flexible design solutions could be created: strategies for dealing with changing circumstances and "just in time" design in close cooperation with the international field.

Artificial landscapes – terraced landscapes

The conclusion of this experimental approach is that the potential of an artificial landscape is a key element for the design of more sustainable and self-sufficient solutions, especially in rural areas, which seek a strongly formed identity in a permanent transformation process.

Like everything else, terraced landscapes also change. There are global issues that influence these changes, such as global economics and climate change, and there are local influences such as depopulation, deintensification, and the development of new ways to maintain and build terraces.

Consequently, terrace systems change in terms of cultural significance, in form, in social networks (because of different lifestyles), and in production (which is changing from a subsistence economy to a market economy). A careful evaluation of the changes that will accommodate how people live in, work with, and inhabit terraced landscapes is required. Terraces will survive in their complexity and uniqueness only if they meet the needs of the people living in terraced landscapes.

TERASIRANE KRAJINE: NOVE OBLIKOVALSKE REŠITVE V PREOBRAZBAH UMETNIH KRAJIN

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POVZETEK

Prispevek raziskuje potenciale umetnih krajin v razvoju novih načel vzdržnega oblikovanja v evropskem podeželskem prostoru. V uvodu so opredeljene prvine umetnih krajin in nekatere njihove preobrazbe. Stavbe, naselja in krajine so neločljivo povezani. Predpostavili smo, da integralni oblikovalski pristop omogoča še boljše usklajevanje krajin in naselij. To tezo smo dokazovali s primerjavo dveh izbranih umetnih krajin, ki se razlikujeta tako v topografskem pogledu kot v hitrosti dinamičnega procesa preoblikovanja krajine. Primerjali smo nizozemsko poldersko krajino in krajino opuščenih terasnih zemljišč v Goriških brdih. Zanimale so nas prostorske posledice opredeljenih oblikovalskih parametrov in osredotočili smo se na vzdržni vpliv podmene. Preizkus je bil opravljen na raziskovalnem modelu na lokaciji vasi Kojsko v Goriških brdih. V procesu oblikovanja novih energetskih krajin so bili razviti različni scenariji, ki so nam omogočili vpogled v prostorske posledice preobražene krajine in naselij. V zaključku smo ugotovili, da procesu preobrazbe v prostoru, ki upošteva krajinske prvine in zakonitosti, sledi sinergija različnih prostorskih parametrov in oblikovalskih orodij, ki se med seboj krepijo. Posledično so prostorske rešitve številne, vzdržne in omogočajo izbiro.

Ključne besede: terasirane krajine, urbano oblikovanje, umetne krajine, Nizozemska, Slovenija

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SPREMINJANJE FUNKCIJ IN IDENTITETE ISTRSKEGA PODEŽELJA NA PRIMERU OBČINE IZOLA

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IZVLEČEK

Najbolj prepoznavne prvine istrske pokrajine so rezultat kmetijske dejavnosti. Podeželje pa je večfunkcijsko in kmetijstvo v zadnjih desetletjih vse bolj nadomešča kombinacija treh prevladujočih funkcij: kmetijstva, potrošnje in varstva. S spreminjanjem razmerja med temi tremi funkcijami in odnosov med njimi se spreminjata tudi videz in identiteta pokrajine. Iz različnih virov smo zbrali in nato analizirali prostorske (GIS) in statistične podatke o potrošnji, kmetijski proizvodnji in varstvu na podeželju občine Izola. Razmerje med funkcijami ni uravnoteženo, prevladujeta potrošnja in varstvo. Pričakujemo lahko nadaljnje manjšanje deleža proizvodnje in večanje deleža potrošnje in varstva. S tem se bo spreminjala tudi identiteta podeželske pokrajine.

Ključne besede: večfunkcijsko podeželje, kmetijstvo, potrošnja, varstvo, identiteta, občina Izola

CAMBIAMENTI DELLE FUNZIONI E DEI CARATTERI IDENTITARI DELLA CAMPAGNA ISTRIANA NEL COMUNE DI ISOLA

SINTESI

Le caratteristiche peculiari che rendono riconoscibile il paesaggio istriano sono il risultato di attività agricole. La campagna si configura come un territorio multifunzionale e negli ultimi decenni una combinazione delle tre funzioni predominanti – coltivazione, consumi e tutela – sta soppiantando l'agricoltura. Con il mutare del rapporto tra queste tre destinazioni d'uso e le loro reciproche relazioni, cambiano anche l'aspetto e i caratteri identitari del paesaggio. Sulla base degli elementi raccolti da diverse fonti, sono stati analizzati i dati ambientali (GIS) e statistici relativi ai consumi, alla produzione agricola e alle misure di tutela nelle aree rurali del comune di Isola. Il rapporto tra le funzioni non è equilibrato: prevalgono i consumi e la tutela e si può quindi ipotizzare una dinamica evolutiva che vedrà questi due fattori ancora in crescita e un'ulteriore decremento dell'agricoltura con un conseguente cambiamento dei tratti identitari distintivi del paesaggio rurale.

Parole chiave: aree rurali multifunzionali, agricoltura, consumo, tutela, identità, comune di Isola

UVOD

Najbolj prepoznavne prvine istrske pokrajine so rezultat kmetijske dejavnosti. V literarnih delih je istrska pokrajina predstavljena kot »… *pokrajina oljk, smokev, grozdja in druge flore, posebej sredozemske. Pokrajini daje svojski značaj še njena prst, relief, bližina morja, podnebje (zlasti burja), pa tudi lokalne prakse, orodja, navade – velike motike, ki so prekopale to zemljo, pridne roke, ki so znosile kamenje z njiv in travnikov v suhe zidove, generacije, ki so zravnale strma pobočja*« (Urbanc, Juvan, 2012, 311). Tudi v turističnih predstavitvah podeželja posameznih obalnih občin je ta, kmetijska, funkcija močno poudarjena. Podeželje v občini Piran je kraj, »[kjer so stare istrske vasice obdane] z oljčnimi nasadi, vinogradi in sadovnjaki [in kjer] kmetje … prizadevno obdelujejo strma pobočja« (TZP, 2015a). Podeželje v občini Izola je idilično opisano kot »spokojna zelena pokrajina med oljkami in vinogradi« (TGZ Izola, 2015). Podeželje pa je vedno manj izključno kmetijsko. Na njem se vse bolj prepleta več funkcij, med katerimi prevladujejo kmetijska proizvodnja, varovanje in potrošnja (Holmes, 2012).

Tudi v občini Izola podeželje ni izključno kmetijsko. Število KMG (kmetijskih gospodarstev) in površina kmetijskih zemljišč se zmanjšuje (SURS, 2015a). Po izračunih iz podatkov o dejanski rabi tal kmetijska zemljišča v relativnem smislu zavzemajo že manjši delež občine, kot zavarovana območja. Zato nas je zanimalo, kakšni so odnosi med tremi funkcijami, tj. kmetijstvom, varstvom in potrošnjo v občini Izola sedaj, kakšni bi lahko bili v prihodnosti in kako bi potencialno vplivali na identiteto istrskega podeželja.

POKRAJINA: GRADNIKI, SPREMINJANJE IN DOJEMANJE

»Pokrajina (geografski prostor) je splet različnih sestavin, ki so organizirane (strukturirane) na različne načine. Na zunaj se kažejo v različni rabi tal, ki je izraz notranjih odnosov med nosilci vzdrževanja/preoblikovanja prostorskih struktur. Le-te se zaradi delovanja različnih dejavnikov (tehnologija, način organiziranja družbe, zunanji dejavniki) spreminjajo, hkrati pa vplivajo na oblikovanje prostorske zavesti oziroma identitete« (Klemenčič, 2008, 103).

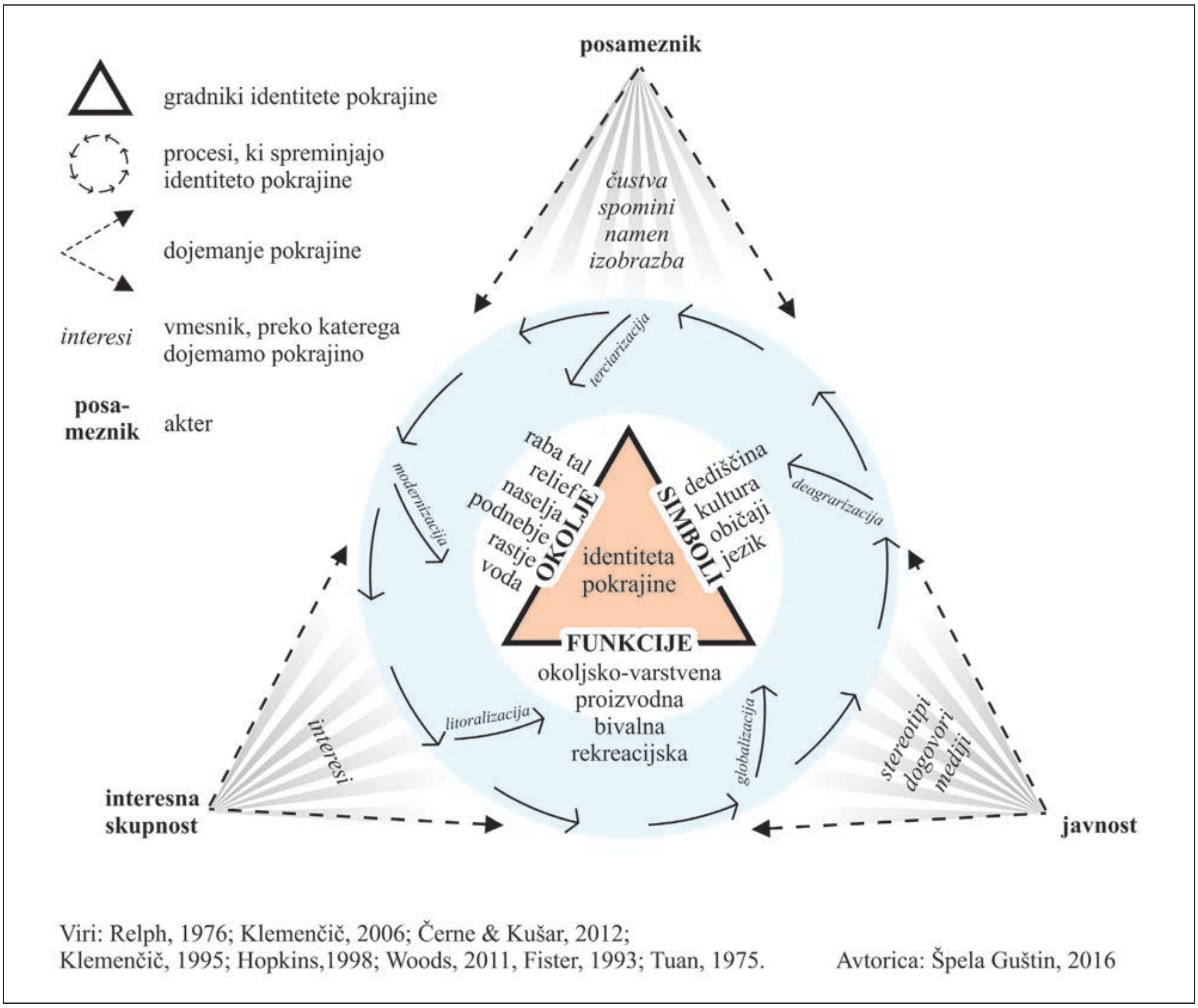
Identiteta pokrajine je zelo kompleksen pojem. Ena pokrajina jih ima več hkrati, na več načinov jo lahko dojema tudi posameznik (Relph, 1976). Neprestano spreminjanje in nešteto možnih kombinacij, ki jih v pokrajini lahko ustvarijo le trije osnovni gradniki, še dodatno povečuje kompleksnost tega pojma. Kot je prikazano na Sliki 1, sestavljajo identiteto pokrajine trije gradniki, spreminjajo jo različni procesi, njeno dojemanje pa je odvisno od različnih akterjev (Relph, 1976; Klemenčič, 2006; Černe, Kušar, 2012; Klemenčič, 1995; Hopkins, 1998; Woods, 1998; Fister, 1993; Tuan, 1975).

Gradniki identitete pokrajine

Identiteto pokrajine sestavljajo trije gradniki: okolje oziroma geografske značilnosti pokrajine, dejavnosti oziroma funkcije in simboli oziroma pomeni. Na Sliki 1 so prikazani s trikotnikom. Med sabo so neločljivo povezani, znotraj vsakega pa je neskončno možnih vsebin in nešteto možnosti za njihovo kombiniranje (Relph, 1976, 61). Identiteta pokrajine pa ni nujno sestavljena le iz tistega, kar v pokrajini vidimo. Sestavljajo jo lahko tudi zvok, vonj, okus in otip (Kljenak et al., 2013; Scott et al., 2009). V prispevku razumemo identiteto podeželja Slovenske Istre kot edinstvenost oblik, vzorcev, gradnikov, procesov, s katerimi prepoznamo neko pokrajino (Stobbelaar, Pedroli, 2011, 323–324). Avtorja sicer ne pojasnjujeta podrobneje, kaj so oblike in kaj vzorci. Obliko razumemo kot videz stvari v pokrajini (na primer oblika in barva stavb, širina vodotoka, vrste dreves in ostalega rastja, barva prsti, uporabljeni gradbeni material za različne objekte, spomeniki, označevalne table in napisi na stavbah), posamezne oblike pa ustvarjajo vzorce (na primer sistem prometnic, rečna mreža, razporeditev stavb v naselju, razporeditev naselij glede na druga naselja, parcelacija, nasad sadnega drevja, obdelovalne terase).

Prvi gradnik identitete je okolje. Sredozemski pokrajini dajejo posebno identiteto trajni nasadi in obdelovalne terase (Ažman Momirski, Kladnik, 2009). Vzdrževanje take pokrajine zahteva velik vložek časa (SURS, 2012a, 42–43) in denarja (Škvarč, Kodrič, 2006). V zadnjih desetletjih pa se število kmetov in površina kmetijskih zemljišč zmanjšujeta (SURS, 2015a). Kmet z (ne)obdelovanjem kmetijskih zemljišč močno vpliva na videz pokrajine (Primdahl, Kristensen, 2011). Precejšnji deli terasirane pokrajine v Koprskem primorju so bili neobdelani že leta 1963 (Titl, 1965). Obdelane terase so le na območjih z zelo ugodnimi pogoji (bližina mesta, zatišna južna lega, blag naklon, možnost uporabe kmetijske mehanizacije; Titl, 1965). Opuščajo pa se majhne terase, v strmih, severnih in odročnih legah (Kladnik, 1990, 143). Z opuščanjem kmetovanja in obdelovalnih teras se spreminja in izginja kulturna pokrajina (Škvarč, Kodrič, 2006; Perpar, Kovačič, 2006). Identiteto pokrajine oblikuje tudi arhitektura (Fister, 1993). Po stopnji ohranjenosti identitete arhitekturnih krajin, ki temeljni na naseljih, ima obalni del Koprskega primorja »komaj še razpoznavno« njegovo podeželsko zaledje pa »dobro razpoznavno« identiteto arhitekturne krajine (Fister, 1993, 29).

Drugi gradnik identitete so funkcije oziroma dejavnosti. Podeželje opravlja več funkcij. Na slovenskem podeželju po drugi svetovni vojni prevladujejo štiri funkcije: proizvodna (kmetijska), bivalna, rekreacijska in okoljsko-varstvena (Klemenčič, 2006; Guštin, Potočnik Slavič, 2015). Z zmanjševanjem kmetijske proizvodnje postaja vse pomembnejše varovanje kulturne pokrajine (Woods, 2005, 54). Ohranjanju kulturne pokrajine so namenjene tudi subvencije EU (Evropske unije). Program razvoja podeželja 2007–2013 (MKO,



Slika 1: Okolje, simboli in funkcije so trije neločljivi gradniki identitete pokrajine. Identiteta se neprestano spreminja z različnimi procesi, akterji pa jo dojemajo prek različnih vmesnikov.

2007a) je znotraj štirih razvojnih osi predvidel različne ukrepe in podukrepe. Ohranjanju okolja in kulturne pokrajine so neposredno bili namenjeni trije ukrepi iz druge osi (izboljšanje okolja in podeželja). Z ukrepoma 211 in 212 se je pomagalo kmetijskim gospodarstvom na območjih z omejenimi možnostmi za kmetijstvo. V okviru ukrepa 214 (kmetijsko okoljska plačila) pa sta bila za Koprsko primorje pomembnejša dva podukrepa:

- podukrep »strmi vinogradi«, kjer je cilj bila obdelava vinogradov z nagibom 30–40 % in s tem ohranjanje kulturne pokrajine in
- podukrep »pridelava avtohtonih in tradicionalnih sort kmetijskih rastlin«, med katerimi so bile tudi različne vrste oljk in vinske trte.

Tretji gradnik identitete so simboli. Kulturna pokrajina je spominska banka (Arnesen, 1998), ki vsebuje mnogo simbolnih pomenov (Antrop, 2005), zato pomembno prispeva k izgradnji lokalne, regionalne in nacionalne identitete (Juvan, Zorn, 2014). Z zavarovanjem območja se ti simboli in vrednote ohranjajo tudi za prihodnje generacije (Dixon, Sherman, 1991). Uspešnost zavarovanih območij pri ohranjanju kulturne pokrajine pa je težko opredeliti, saj ponekod taka območja pospešujejo opuščanje kmetijske rabe tal (Ruiz-Benito et al., 2010; Schmitz et al., 2010), včasih pa se ne da z gotovostjo trditi, ali imajo kakšen vpliv ali ne (Miličić, Udovč, 2012). Ohranjanju kulturne pokrajine so namenjene tudi različne prireditve, s katerimi se predstavljajo lokalni običaji in ohranja kulturna dediščina. Te prireditve pa so pogosto pripravljene prav v turistične namene (Clendenning, Field, 2005), s čimer prihaja do komercializacije dediščine oziroma identitete. Sodobni obiskovalci namreč želijo podeželje videti, okusiti in začutiti (Daugstad, 2008) in zato, poleg tradicionalnih

podeželskih jedi in pijače, uživajo (v prenesenem pomenu) tudi simbole in domišljijo (Bessière, 1998, 23).

Spreminjanje identitete

Identiteta prostora ni statična in nespremenljiva, ampak se spreminja s spreminjanjem okoliščin in vrednot (Relph, 1976, 45). Izoblikuje se postopoma (Zupančič, 1998). Na Sliki 1 je to spreminjanje prikazano s krogom iz puščic, ki predstavljajo različne procese.

Slovensko podeželje oblikuje več procesov, ki povzročajo različne spremembe. Po drugi svetovni vojni so ga odločilno preoblikovali industrializacija (in z njo deagrarizacija), modernizacija (še posebno motorizacija) in terciarizacija (Klemenčič, 2006). Industrializacija je na Srednjem in Zgornjem Gorenjskem povzročila priseljevanje novih prebivalcev, mesta srečevanja ob vaški lipi so ponekod nadomestili novi prostori, slabila se je pripadnost vaški skupnosti (Klemenčič, 1995). Podobne spremembe povzroča globalizacija ki prinaša na podeželje spremembe v obliki novih akterjev, procesov in povezav (Woods, 2007). Na slovenskem podeželju tako lahko zasledimo tujce, ki kupujejo nepremičnine v različnih predelih Slovenije in s tem ponekod pomagajo ohranjati kulturno dediščino (Lampič et al., 2015). Na obalnem območju pa lahko zasledimo vplive litoralizacije, ki ustvarja dvojnost med obalnim območjem in zaledjem. V Slovenski Istri je na obalnem območju visoka zgostitev prebivalcev in gospodarskih dejavnosti, naselja imajo višje stopnje središčnosti, intenzivnost in raznolikost rabe zemljišč pa je visoka. Nasprotno je v zaledju zgostitev prebivalcev in gospodarskih dejavnosti manjša, naselja so majhna, intenzivnost rabe zemljišč pa nizka (Černe, Kušar, 2012, 214).

Vsaka sprememba, ki jo povzročijo prej našteti procesi, pa še ne pomeni spremembe prostorske identitete, kar je Antrop (1998, 157) primerjal s staranjem človeka. Čeprav se s staranjem človek spremeni, ga lahko še vedno prepoznamo. Enako je v pokrajini, kjer nekatere spremembe lahko ustvarijo povsem drugačno pokrajino, druge pa nanjo nimajo velikega vpliva (Antrop, 1998). Spremembe v pokrajini so lahko posledica naravnih procesov, lahko pa jih povzroči človek (Antrop, 1998). Lahko so »izgubljene v bitki« pri načrtovanju bodočega razvoja ali pa »zbledijo« (Arnesen, 1998, 45). Prav to počasno bledenje pokrajine je bolj zaskrbljujoče, saj pomeni, da družba ni poskrbela za njeno ohranjanje (Arnesen, 1998). Primer počasnih sprememb, ki spremenijo identiteto pokrajine, je lahko zaraščanje Krasa (Kaligarič, Ivanjšič, 2014), primer hitre spremembe pa vnos novih elementov, kot so na primer vetrne elektrarne (Short, 2002).

Dojemanje pokrajine

»Obstaja toliko identitet pokrajine, kolikor je ljudi« (Nairn, 1965, 78 v Relph, 1965, 45). To tudi pomeni, da ima pokrajina več identitet hkrati. Na Sliki 1 so s črtkanimi pari puščic prikazani trije različni pogledi na pokrajino: pogledi posameznika, interesne skupnosti in javnosti. Vse tri skupine akterjev opazujejo enako pokrajino, a jo dojemajo na različne načine. Dojemanje poteka preko različnih vmesnikov. Pri posamezniku nanj vplivajo čustva, spomini namen, izobrazba (Tuan, 1975), pri interesnih skupnostih so v ospredju različni interesi, javnost pa identiteto pokrajine oblikuje preko stereotipov, dogovorjenih simbolov in poročanja medijev (Relph, 1976).

Poleg tega, da pokrajino različno dojemajo različne skupine akterjev, jo lahko na več načinov dojema tudi posameznik. Pokrajino dojema drugače, če se na primer po njej vozi ali če hodi (Relph, 1976, 56). Lahko pripada več socialnim skupinam. Lahko je domačin in prostorski načrtovalec in je istočasno zmožen dojemati pokrajino subjektivno in objektivno (Relph, 1976, 62). Identitete pokrajine se torej prekrivajo in soobstajajo.

Identiteta pokrajine je drugačna, če se nahajamo v pokrajini ali izven nje (Relph, 1976). Kmet dojema pokrajino drugače kot obiskovalec (Daugstad, 2008), Istrani pa drugače kot lastniki počitniških bivališč iz osrednje Slovenije. Čeprav so Slovenci, jih domačini obravnavajo kot tujce (Urbanc, Juvan, 2012, 310). Do razlik prihaja tudi pri zunanji in notranji predstavi o kraju – tako se na primer tovarna Elan in ansambel bratov Avsenik prebivalcem Begunj ne zdita nič posebnega, čeprav sta svetovno znana (Klemenčič, 1995, 53).

Identiteto podeželja oblikujejo tudi mediji (Klemenčič, 2006, 166; Hopkins, 1998; Daugstad, 2008). Z analizo brošur je Hopkins (1998, 76) določil pet stereotipov, ki se najpogosteje uporabljajo pri pripisovanju identitete idiličnega podeželja nekemu kraju. To so naravno okolje, ohranjena dediščina, skupnost, prostor za pobeg od vsakdana in prostor doživetij. Podobno moč imajo pisci različnih strategij, zakonov in opredelitev, preko katerih vplivajo na dojemanje podeželja (Woods, 2011, 232; Daugstad, 2008; Paasi, 2013).

METODE

Za določitev identitete podeželja v občini Izola smo analizirali prostorske in statistične podatke (Slika 2). Za vsako od treh proučevanih funkcij podeželja smo pridobili raznovrstne podatke pri različnih upravljavcih podatkov. Večina podatkov je bila prosto dostopnih na spletnih straneh, nekatere podatke pa smo naročili pri upravljavcih (Ministrstvo za kulturo, ARSKTRP (Agencija RS za kmetijske trge in razvoj podeželja) – podatki o kmetijskih gospodarstvih, Državni arhiv v Trstu, Ministrstvo za okolje in prostor, Geodetska uprava Republike Slovenije). Podatki franciscejskega katastra, podatki o kmetijskih zemljiščih v zakupu in podatki o grafičnih enotah rabe zemljišč kmetijskega gospodarstva so pred analizo zahtevali še dodatno obdelavo.

Liste franciscejskega katastra smo združili v programu Adobe Photoshop ter nato georeferencirali in digi-

talizirali v programu ArcMap 10.1 (Petek, Fridl, 2004). Da bi lahko primerjali spremembe rabe tal med letoma 1818 in 2012, smo kategorije rabe tal iz franciscejskega katastra in iz evidence o dejanski rabi tal uskladili in poenostavili. Primerjavo podatkov o rabi tal med letoma 1818 in 2012 smo nato naredili z uporabo orodja Land Change Modeller v programu Idrisi Selva.

Podatki o kmetijskih zemljiščih v zakupu so prosto dostopni na spletni strani SKZG (Sklada kmetijskih zemljišč in gozdov), a ne v obliki, ki bi omogočala kakršne koli analize. Podatkov je zelo veliko (preko 1000 zakupnikov v občini Izola), zaradi načina prikaza podatkov pa je njihovo kopiranje v Excel tudi zelo zamudno. Podatke o parcelah v zakupu smo zato s spletne strani pridobili tako, da smo napisali dva nekajvrstična programa (robota) v programskem jeziku Python 3.3.3. Robota sta namesto nas samodejno odpirala podstrani in podatke shranjevala v novo preglednico. Takšno avtomatizirano pridobivanje podatkov s spletnih strani je sporno (Jennings, Yates, 2009). Vseeno pa se pogosto uporablja pri delu z večjo količino podatkov (na primer Johnson et al., 2011; Yang et al., 2010). Na podlagi parcelne številke smo podatke o parcelah v zakupu nato lahko uvozili v ArcMap. Med podatki so bile tudi neobstoječe parcelne številke. Nove številke smo poiskali v zgodovinskih zemljiškoknjižnih izpiskih na portalu e-sodstvo.

Podatki o GERK (grafičnih enotah rabe zemljišč kmetijskega gospodarstva), pridobljeni na ARSKTRP, so bili anonimizirani – iz podatkov ni bil razviden KMG-MID (identifikator kmetijskega gospodarstva). Razvidno pa je bilo, kateri GERKi so v uporabi istega kmetijskega gospodarstva. Podatkom je bil dodan tudi podatek o lokaciji kmetijskega gospodarstva (XY koordinata). Na podlagi koordinate smo podatke lahko prikazali v programu ArcMap, na podlagi šifre GERK-PID (neponovljiva identifikacijska številka GERKa) pa povezali z grafičnimi podatki o GERK.

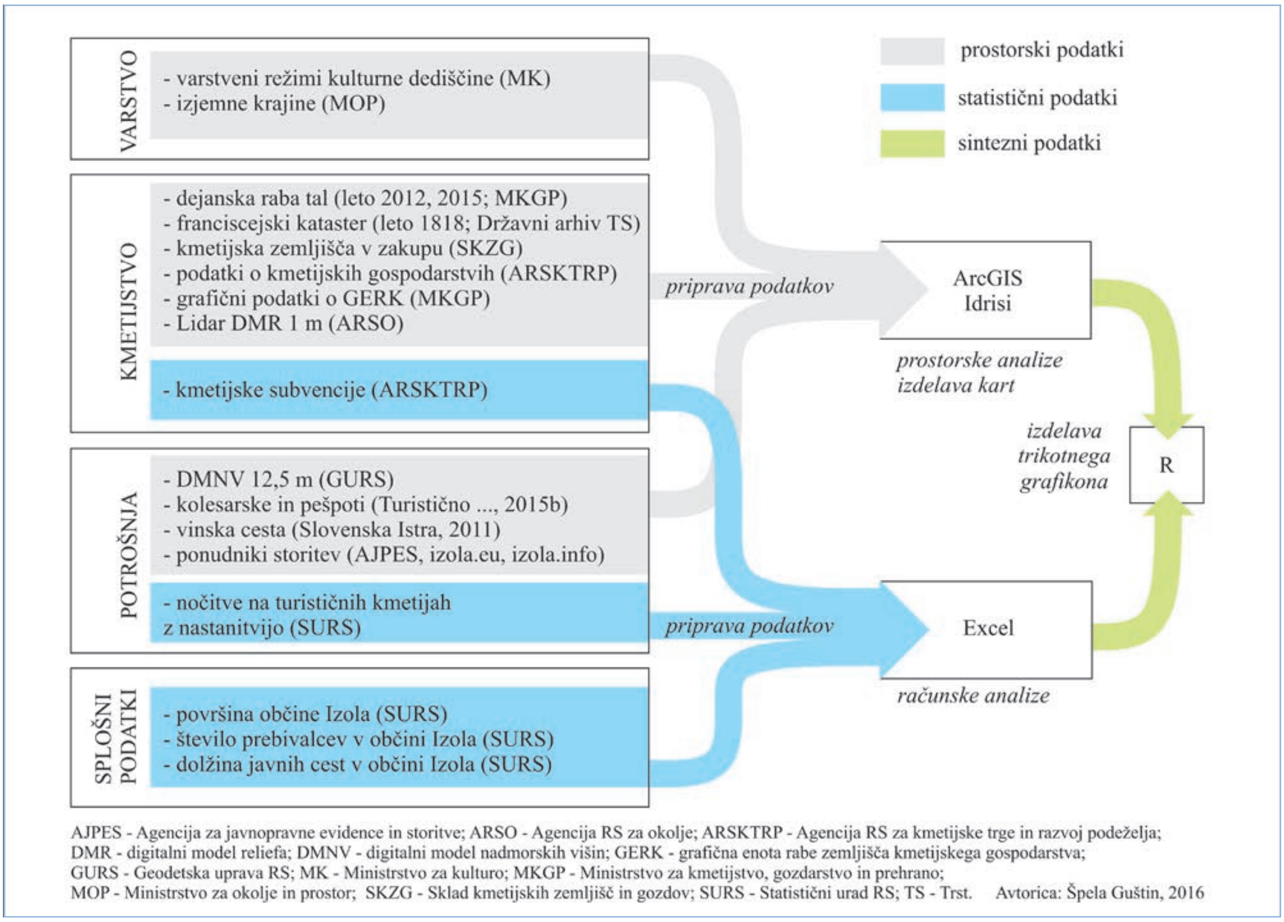
Preostale podatke smo uvozili v program ArcGIS in Idrisi oziroma Excel ter izvedli prostorske in računske analize. Obdelovalne terase smo določili s pomočjo računanja naklonov iz DMR (digitalnega modela reliefa) v programu ArcMap. Kot terase smo določili območja z naklonom med 5° in 16°. V Idrisiju smo iz dobljenega sloja odšteli vse pozidane površine (poligoni s šifro 3000 v sloju dejanske rabe tal) in strma pobočja v 25-metrskem pasu na obeh straneh vodotokov, ker imajo podobne naklone, a na njih ni teras. Sloj teras smo prekrili s slojem gozdov, ki smo jih izločili iz podatkov o dejanski rabi tal (poligoni s šifro 2000). Celicam, kjer sta se sloja prekrivala, smo pripisali vrednost 2 (opuščene terase), vsem ostalim celicam s terasami vrednost 1, preostalim celicam pa vrednost 0. V programu Idrisi smo izračunali tudi razgled na morje. Uporabili smo digitalni model nadmorskih višin z ločljivostjo 12,5 m in ukaz Viewshed. Podatke o subvencijah Evropskega sklada za kmetijstvo in razvoj podeželja smo analizirali v programu Excel. Analizirali smo le podatke za obdobje 16. 10. 2013 – 15. 10. 2014 in ne podatkov za celotno programsko obdobje. Podatki za pretekla leta so sicer dostopni na spletni strani ARSKTRP, a so vanj zajete le pravne osebe in zato niso primerljivi s podatki iz analiziranega obdobja.

Podatke, ki niso bili v digitalni obliki ali obliki, primerni za uvoz v GIS (geografski informacijski sistem), smo spremenili v ustrezno obliko oziroma jih digitalizirali. Kolesarske in pešpoti smo iz formata .gpx pretvorili v format .shp s programom Global Mapper. Vinsko cesto smo digitalizirali z zemljevida (Slovenska Istra: poti po Slovenski Istri, 2001) v programu ArcMap. Z istim programom smo izračunali tudi prekrivanje odsekov tematskih poti (Webber, 2015) ter na podlagi naslova vanj vnesli ponudnike storitev (vinotoči, gostilne, turistične kmetije ipd.) . Pri slednjem smo si pomagali s slojem hišnih številk, pridobljenim na Geodetski upravi RS.

Pridobljene podatke smo razvrstili v tri skupine (kmetijstvo, varstvo, potrošnja) in z računanjem deležev poskušali določiti zastopanost posamezne funkcije. Za izračun deležev in primerjavo podatkov med sabo smo na Statističnem uradu pridobili tudi nekaj splošnih podatkov o občini (površina, število prebivalcev, dolžina javnih cest). Sintezne podatke smo prikazali na trikotnem grafikonu izdelanem s pomočjo programa R.

Uporabljene metode imajo nekaj prednosti in slabosti. Identiteto pokrajine sestavljajo merljivi in nemerljivi kazalci. V statističnih in prostorskih podatkih so zajeti le merljivi. Pri deležih v trikotnem grafikonu so zato nekoliko slabše zastopane vrednote (varstvo) in potrošnja, bolj pa kmetijska proizvodnja, o kateri je na voljo tudi več podatkov. Pri računanju deležev smo uporabili aritmetično sredino, ki pa ne zajame vse kompleksnosti funkcij podeželja. Posameznim podatkom bi bilo verjetno bolj smiselno pripisati različne uteži, ki bi jih določili strokovnjaki. Ti bi lahko precej pomagali tudi pri določanju vrednosti težje merljivih kazalcev.

Med težje merljive kazalce sodijo tudi obdelovalne terase. GIS sloja obdelovalnih teras nismo našli, zato smo ga poskušali izdelati sami. Uporabljena metoda za določanje obdelovalnih teras ima pomanjkljivosti in tudi velike prednosti. Lidar posnetki omogočajo proučevanje reliefa tudi pod rastjem (Triglav Čekada, 2011), zato smo lahko z GIS določili tudi opuščene obdelovalne terase, ki jih v preteklih raziskavah niso mogli določiti niti s pomočjo ortofoto posnetkov niti s terenskim delom (Ažman Momirski et al., 2008, 79). V njihovem primeru je bila površina identificiranih obdelovalnih teras zato nekoliko manjša. Z določanjem območij s terasami na podlagi naklona vanje zajamemo tudi druga območja, kar je pomanjkljivost te metode. Med njimi so na primer terase, ki so pozidane, območja, kjer se odlaga gradbeni material v obliki teras ali območja z enakim naklonom, na katerih ni teras (na primer ob vodotokih). Zato je površina obdelovalnih teras nekoliko večja od dejanskega stanja. Za točnejše površine bi verjetno morali uporabiti drugačno metodo določanja teras. Z iskanjem opuščenih obdelo-



Slika 2: Prikaz uporabljenih podatkov in njihove analize za določanje identitete pokrajine.

valnih teras se še posebno ukvarjajo arheologi (McCoy et al., 2011) in geomorfologi (Triglav Čekada, 2011).

REZULTATI

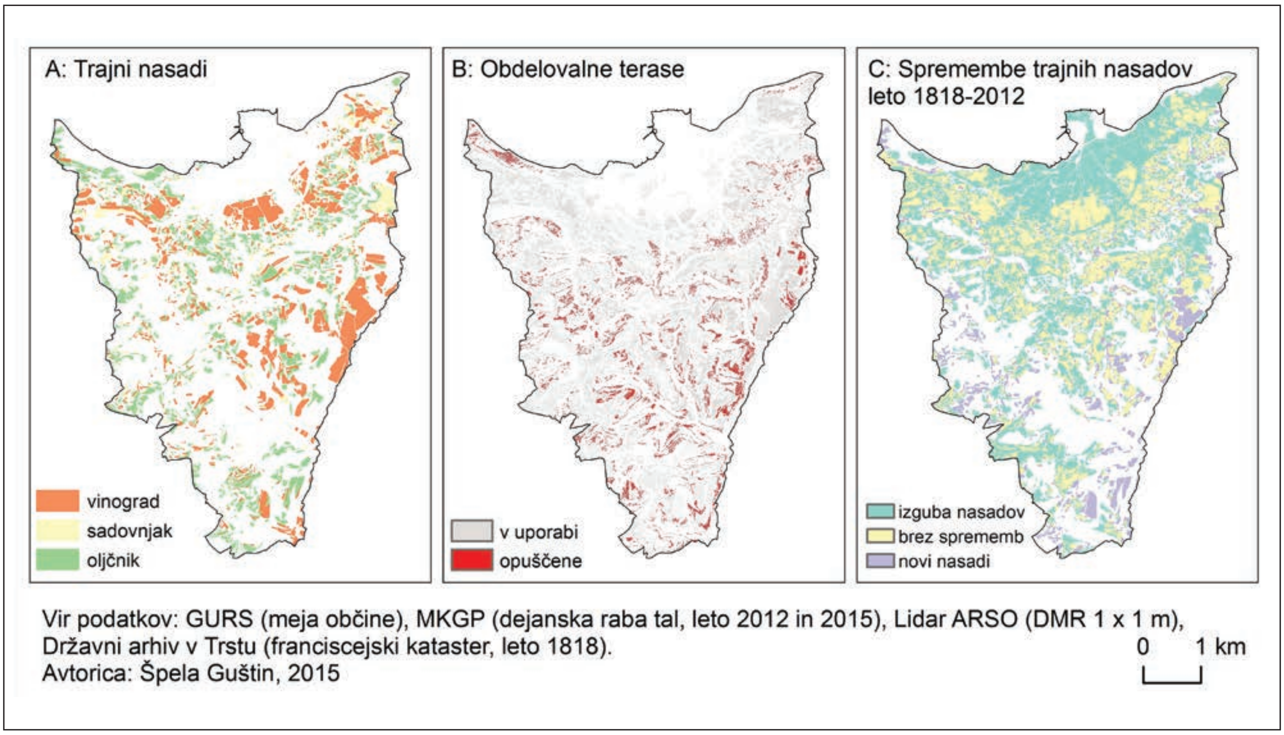
Pri proučevanju spreminjanja identitete smo se osredotočili na tri funkcije, ki prevladujejo na slovenskem podeželju (Klemenčič, 2006): kmetijstvo, potrošnjo in varstvo. Na podeželju Slovenske Istre je njihova zastopanost precej drugačna od slovenskega povprečja.

Kmetijska pridelava

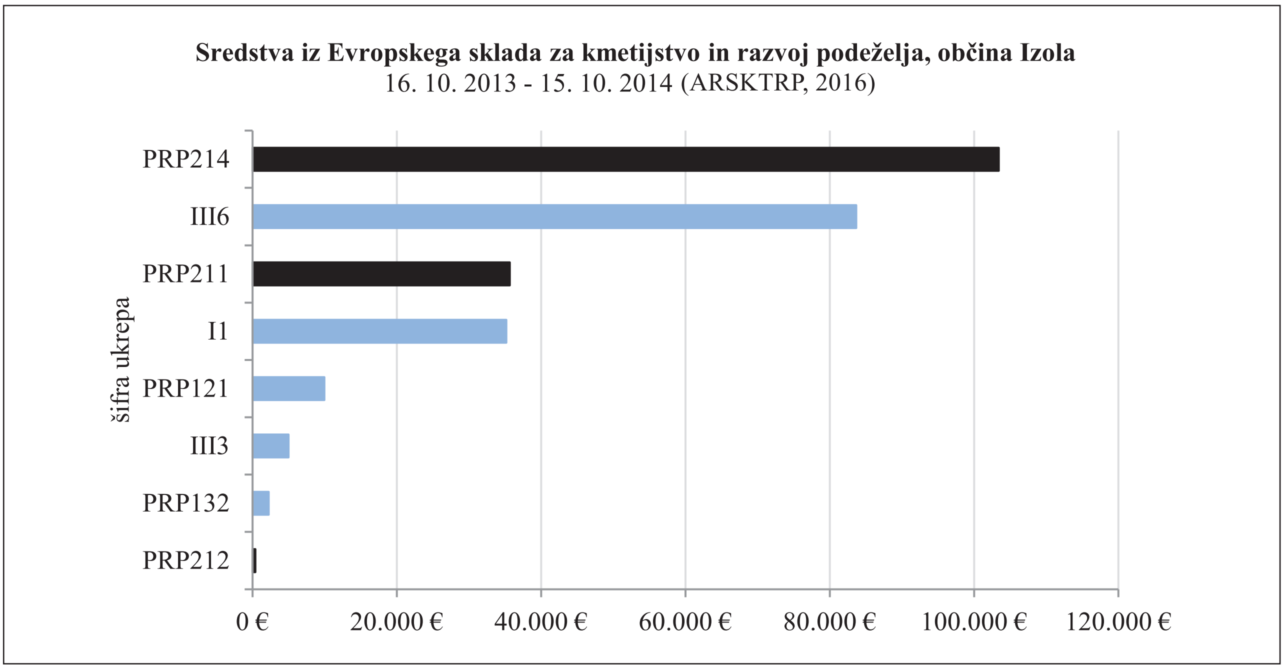
V občini Izola ima GERK 549 kmetijskih gospodarstev. Med njimi prevladujejo majhni samooskrbni kmetje z manj kot tremi hektari obdelovalnih zemljišč. Kmetijska zemljišča v občini Izola zavzemajo 58 % površine občine, polovico teh zemljišč pa predstavljajo trajni nasadi, med katerimi prevladujejo vinogradi in oljčniki (Slika 3a).

Z analizo rabe tal med letoma 1818 in 2012 je bilo ugotovljeno, da se je površina trajnih nasadov v občini Izola v skoraj 200-letnem obdobju zmanjšala za 648 ha (Slika 3c). Na račun pozidave je bilo izgubljenih 295 ha, zaradi ogozdovanja 211 ha, zaradi ozelenjevanja 123 ha, zaradi njiv pa 47 ha trajnih nasadov. Z zmanjševanjem trajnih nasadov je povezano tudi opuščanje obdelovalnih teras (Slika 3b). Opuščene obdelovalne terase zavzemajo 128 ha, kar je približno enaka površina kot jo pokrivajo njive, oziroma 11 % površine gozdov. Površina teras v uporabi je 697 ha.

V obdobju 16. 10. 2013 – 15. 10. 2014 so upravičenci v občini Izola prejeli 275.515,32 eur sredstev iz Evropskega sklada za kmetijstvo in razvoj podeželja (ARSKTRP, 2016; Slika 4). Največ prejetih sredstev je bilo iz ukrepov druge osi Programa razvoja podeželja (51 %; ukrepi 211, 212, 214). Ukrepi iz prve osi so predstavljali 4 odstotke (ukrep 121 in 132), preostali ukrepi pa 45 odstotkov vseh prejetih sredstev. Občina ni prejela sredstev iz ukrepov tretje osi Programa razvoja podeželja. Največ sredstev je bilo iz ukrepa 214 – kmetijsko okoljska plačila, približno 20.000 eur manj pa je bilo prejetih sredstev iz podpornih ukrepov v vinskem sektorju. Podatki se nanašajo le na eno leto v programskem obdobju. Za natančnejšo analizo bi bilo potrebno analizirati podatke za daljše časovno obdobje.



Slika 3: Prikaz elementov kmetijske proizvodnje na podeželju občine Izola.

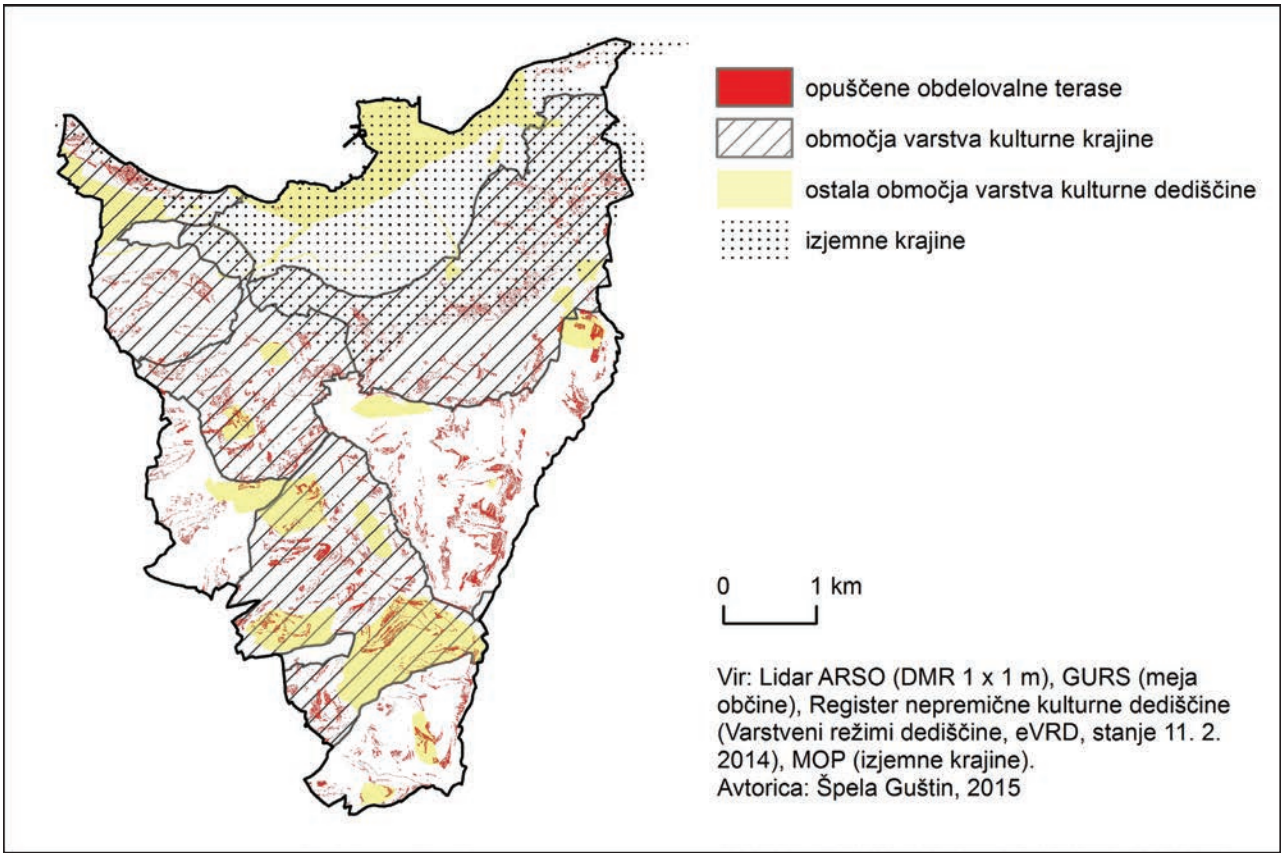


(PRP214 – kmetijsko okoljska plačila, III6 – podporni ukrepi v vinskem sektorju , PRP211 – plačila kmetom zaradi omejenih možnosti na gorskih območjih (OMD), I1 – shema enotnega plačila; PRP121 – naložbe v kmetijska gospodarstva, III3 – shema šolskega sadja in zelenjave, PRP132 – sodelovanje kmetijskih proizvajalcev v shemah kakovosti hrane, PRP212 – plačila kmetom na območjih z omejenimi možnostmi, ki niso gorska območja (OMD)).

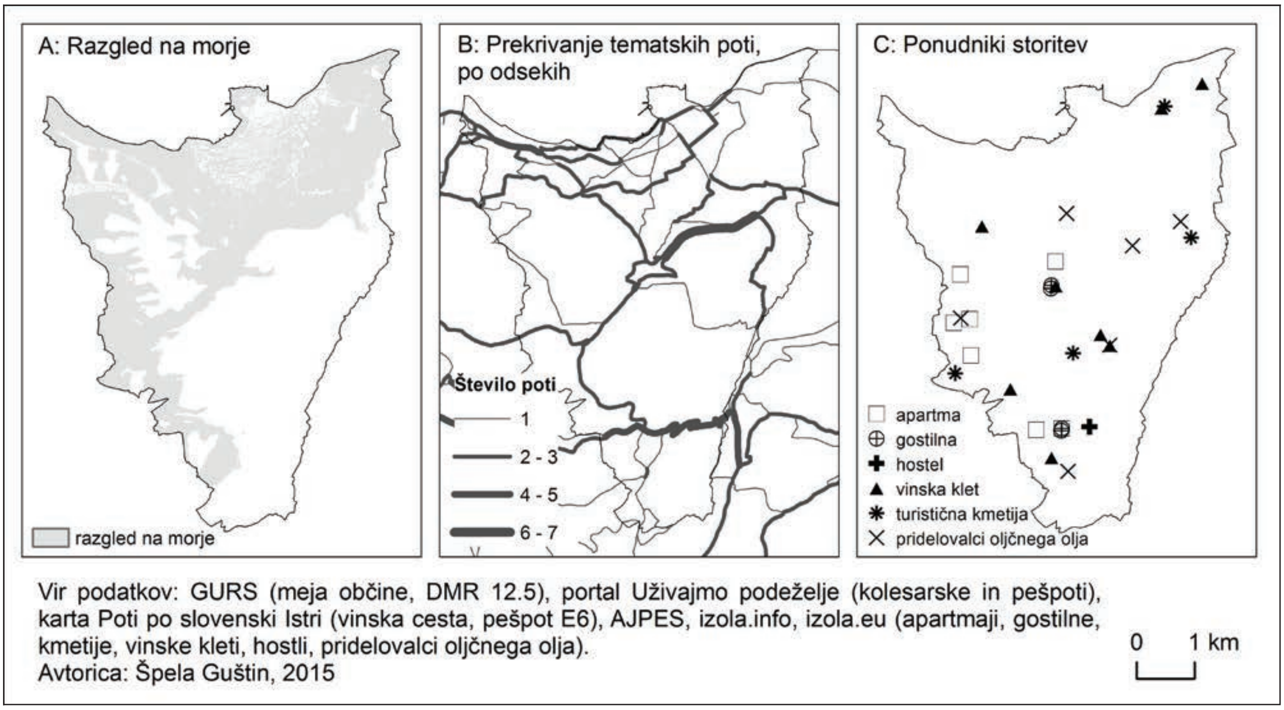
Slika 4: Občina Izola je iz Evropskega sklada za kmetijstvo in razvoj v obdobju 2013–2014 prejela 275.515,32 eur. Od tega je bilo 51 odstotkov namenjeno varstvu kulturne pokrajine (■), preostalih 49 odstotkov pa kmetijski proizvodnji (■).

Tabela 1: Zavarovana območja kulturne krajine v občini Izola (Povzeto in prirejeno po Ministrstvo za kulturo RS, 2015; Ministrstvo za kulturo RS, 2014).

Ime kulturne krajine	Opis enote dediščine in njena EŠD (evidenčna številka dediščine)
Kulturna krajina Izolski amfiteater	Največje območje v Sloveniji s pretežno dobro ohranjenimi obdelovalnimi terasami, ki so tudi topografsko smiselna organizacija prostorske rabe. (EŠD 9761)
Kulturna krajina Cetore-Korte	Dinamično oblikovana obmorska pokrajina z globokimi dolinami in strmimi pobočji, s strnjenimi naselji in zaselki. Uravnave so antropogeno preoblikovane v obdelovalne terase, strmejši predeli pa so zaraščeni z gozdom. (EŠD 21627)
Kulturna krajina Koštrlag	Dolina zgornjega toka Strunjanskega potoka, ki je podaljšek Strunjanske doline. Ohranjene so obdelovalne terase s posameznimi razpršenimi kmetijami. (EŠD 9760)
Kulturna krajina Strunjanska dolina	Antropogeno preoblikovano območje za kmetijsko namembnost. Obdelovalne terase imajo podporne zidove iz lokalnega kamna. Značilna je razpršena poselitev. Tu so tudi soline, drevored pinij, varovalni gozd in trasa opuščene železnice. Med kmetijskimi kulturami prevladujejo oljke, trte in sadovnjaki. (EŠD 28262)
Kulturna krajina Sveti Peter-Padna-Nova vas	Antropogeno preoblikovano območje za kmetijsko namembnost. Obdelovalne terase imajo podporne zidove iz lokalnega kamna. Gozd ima varovalno funkcijo. Na slemenih so strnjena naselja. Med kmetijskimi kulturami prevladujejo oljke, trte in povrtnine. (EŠD 28602)



Slika 5: Do opuščanja obdelovalnih teras prihaja tudi na območjih kulturne krajine, ki so zavarovana in prepoznavna prav zaradi obdelovalnih teras.



Slika 6: Prikaz elementov potrošnje na podeželju občine Izola.

Med ukrepi, iz katerih je občina pridobila sredstva, sta bila tudi ukrepa 211 in 212, za kmetovanje na območjih z omejenimi dejavniki. Ukrep 211 je bil namenjen območjem, ki so gorska, ukrep 212 pa območjem, ki niso gorska. Gorska območja so bila določena na podlagi povprečne nadmorske višine (najmanj 700 m) ali naklona (najmanj 20 %) ali obojega hkrati (območje, ki ima hkrati povprečno nadmorsko višino 500 m in naklon vsaj 15 %; MKO, 2007b). Na podlagi teh meril (naklona) se je tudi občina Izola uvrščala med gorska območja, čeprav jo sestavlja flišnato gričevje.

Občina je prejemala tudi sredstva iz sheme šolskega sadja in zelenjave. Vanjo sta bili vključeni dve izolski osnovni šoli. Shema je spodbujala nakup sadja in zelenjave pri lokalnih pridelovalcih (MKGP, 2016), s čimer se spodbuja tudi kmetijsko pridelavo in s tem ohranjanje kulturne pokrajine.

Varovanje

V občini Izola je z različnimi režimi varovanja zavarovano 63 % občine. Največje območje (16 km^2) predstavlja pet območij kulturne krajine: kulturna krajina Izolski amfiteater, kulturna krajina Cetore-Korte, kulturna krajina Koštrlag, kulturna krajina Strunjanska dolina in majhen del kulturne krajine Sveti Peter-Padna-Nova vas. V vseh petih kulturnih krajinah so obdelovalne terase pomemben prepoznavni element (Tabela 1), a vseeno prihaja do njihovega opuščanja. Do opuščanja prihaja tudi na območju izjemne krajine (Slika 5).

Vzrokov za opuščanje obdelovalnih teras je več. Titl (1965, 65–66) omenja različne škodljivce, dajatve, družbenopolitične dogodke in pomanjkanje delovne sile. Razlog je lahko tudi uvajanje kmetijskih strojev (Ažman Momirski, Kladnik, 2009, 114) ter oddaljenost, naklon in velikost parcele (Kladnik, 1990, 143). Eden od razlogov pa so lahko tudi upravni postopki. Po 80. členu Zakona o kmetijskih zemljiščih (Uradni list RS, 2011) je obnova ali ureditev novih obdelovalnih teras zahtevna agromelioracija in za uvedbo tega postopka MKGP (Ministrstvo za kmetijstvo, gozdarstvo in prehrano) izda odločbo. K vlogi za izdajo take odločbe je potrebno priložiti različne priloge (soglasje lastnikov, ocena pričakovanih učinkov agromelioracije, lokacijska informacija, navedba virov financiranja, popis del) in plačati upravno takso. V posameznih primerih (odvisno od lokacije in velikosti predvidenega posega) pa je potrebno priložiti tudi okoljevarstveno dovoljenje Agencije za okolje, presojo vplivov na okolje, mnenje Zavoda za gozdove, mnenje Zavoda za varstvo narave, mnenje Zavoda za varstvo kulturne dediščine, mnenje za poseg v varovalni pas ceste (MKGP, 2015).

Potrošnja

Po podeželju občine Izola poteka 20 kolesarskih poti in pešpoti, nekatere so tudi tematske in se navezujejo na kraje v sosednjih občinah. Med temi potmi so tudi evropska pešpot E6, vinska cesta in pot po nekdanji trasi železnice Trst–Poreč. Poti se med sabo prekrivajo

Tabela 2: Izbrani kazalci

Funkcija/Kazalec	Vrednost (Vrednost za izris Slike 7)	Vir podatka
Potrošnja	55,86 % (44,84 %)	
dolžina kolesarskih poti, pešpoti in tematskih poti**	116,9 %	TZP, 2015b; Slovenska Istra: poti po Slovenski Istri, 2001
% nočitev na tur. kmetijah z nastanitvijo (2009) ***	2,7 %	SURS, 2015c
% občine z razgledom na morje*	48 %	izračun iz DMR12,5 (GURS)
Kmetijstvo	18,28 % (14,67 %)	
% KMG, ki ima GERK v občini Izola***	3,46 %	ARSKTRP, 2014
% trajnih nasadov*	28,7 %	dejanska raba tal 2015 (MKGP, stanje 30. 9. 2015)
% obdelovalnih teras*	24,4 %	izračun iz DMR (ARSO, 2015)
% opuščenih teras*	4,5 %	izračun iz DMR (ARSO, 2015)
% kmetijskih zemljišč v zakupu SKZG*	33,04 %	SKZG, 2014****
Varstvo*	50,45 % (40,49 %)	
% vseh zavarovanih območij	63 %	MK RS, 2014
% zavarovanih območij kulturne krajine	55,9 %	MK RS, 2014
% površja, opredeljen kot izjemna krajina	32,45 %	Ministrstvo za okolje in prostor

* Deleži so izračunani glede na površino občine Izola (28,6 km^2).
** Deleži so izračunani glede na dolžino javnih cest v občini Izola (131,8 km; SURS, 2012b).
*** Deleži so izračunani glede na št. prebivalcev občine na dan 1. 7. 2015 (15.881; SURS, 2015b).
**** Zdaj preimenovana v Evidenca zakupnih razmerij (www.s-kzg.si/si/aplikacija-pavzau/).

(uporabljajo iste odseke cest), zato so določeni odseki uporabljeni večkrat (Slika 6b). Izstopajo trije: sleme na severozahodu občine v Krajinskem parku Strunjan, sleme vzhodno od Šareda in pot skozi naselje Korte na jugu. Z obeh slemenskih poti je razgled na morje (Slika 6a), pot pa je speljana med nasadi oljk in vinogradi. Pot skozi Korte poteka skozi naselje, ki je zavarovano kot kulturni spomenik. V imenih poti se uporabljajo naravne in kulturne danosti podeželja – sonce, razgled, vodni viri, oljke (Pot po soncu, Pot mimo vodnih virov in lepih razgledov, Oljčna pot). Ob poteh so različni ponudniki prenočišč, hrane in pijače: vinske kleti, turistične kmetije, gostilne, pridelovalci oljčnega olja, hostel (Slika 6c).

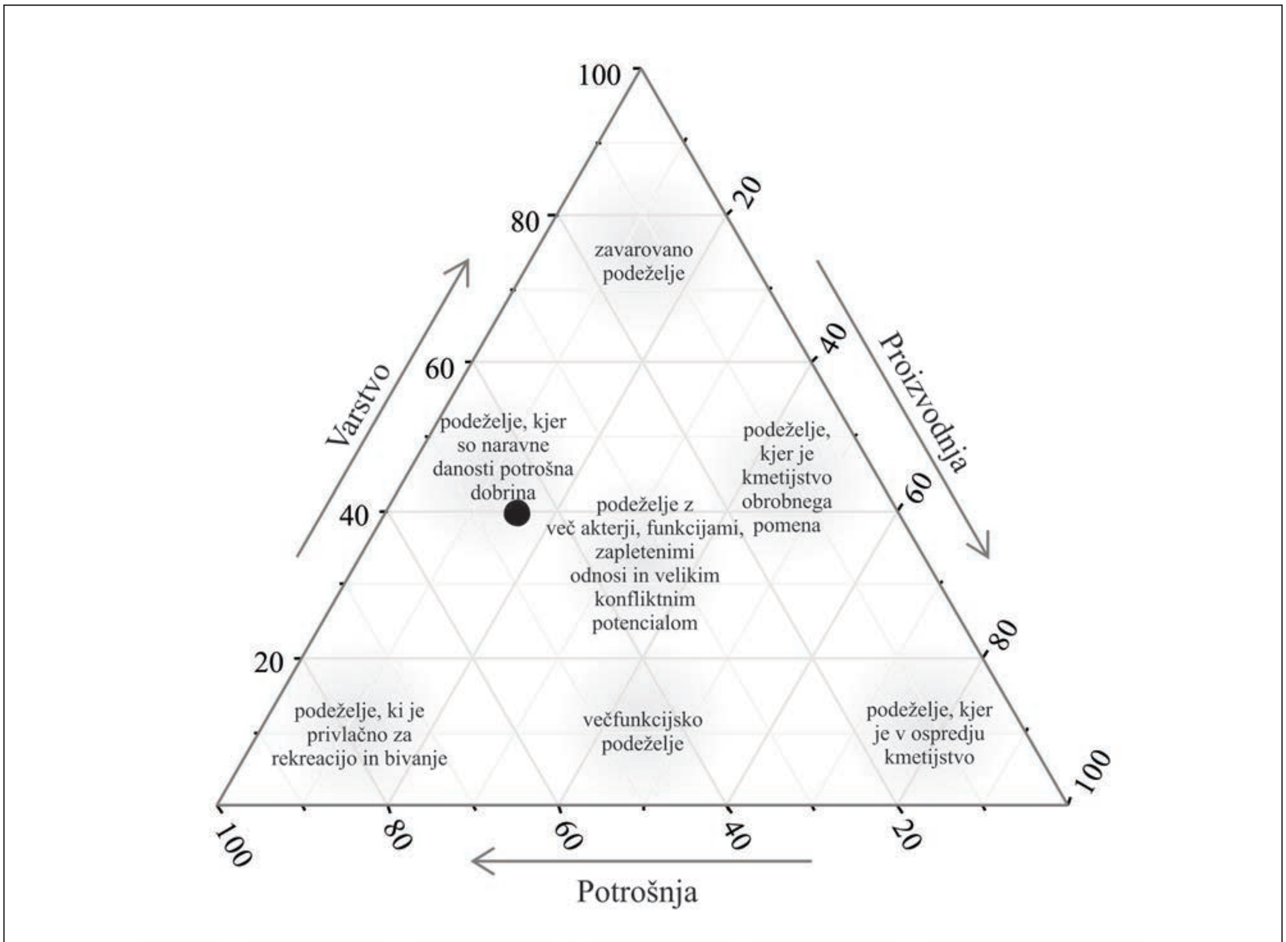
Med marcem in majem gostilne in turistične kmetije na podeželju obiskovalcem nudijo »fritajo« in druge jedi s sezonskimi zelišči. S projektom, poimenovanim »Erbe per ovi« (»zelišča za jajca«), želijo gostom približati avtohtono gastronomsko ponudbo izolskega podeželja[1], hkrati pa obujajo simbol Šavrinke, ki je v Trst hodila prodajat jajca in zelišča, iz katerih so Tržačani nato delali »fritaje« (Zalar, 2013).

Razmerje med kmetijstvom, varstvom in potrošnjo na podeželju občine Izola

Za prikaz identitete podeželja smo uporabili več kazalcev, ki smo jih razdelili v tri skupine (Tabela 2). Deleže v stolpcu »Vrednost« smo računali glede na površino občine (če so podatki bili ploskovni), glede na število prebivalcev (če so se podatki nanašali na ljudi) in glede na dolžino javnih cest v občini (če so podatki bili linijski). V stolpcu »Vrednost« je v sivih vrsticah izračunana aritmetična sredina vsake skupine kazalcev. Vrednosti za izris trikotnega grafikona, ki so podane v oklepaju, so izračunane glede na seštevek aritmetičnih sredin vseh treh skupin. Prikaz razmerja med temi tremi skupinami je na Sliki 7.

Na podlagi uporabljene metode je tako mogoče izračunati, da razmerje med kmetijsko proizvodnjo, potrošnjo in varstvom ni uravnoteženo. Delež potrošnje in varstva je skoraj enak (44,84 % oziroma 40,49 %), medtem ko kmetijstvo predstavlja le 14,67 % (Slika 7). Funkcije se prepletajo, mi pa smo posamezni kazalec

1 Delo, 14. 3. 2014: V Izolo na lokalno hrano, 10.



Slika 7: Razmerje med proizvodnjo, potrošnjo in varstvom na podeželju v občini Izola (prirejeno po Holmes, 2012).

uvrstili le v eno skupino, čeprav bi lahko hkrati bil v več skupinah. V takem primeru bi se razmerje med funkcijami verjetno spremenilo.

DISKUSIJA

Identiteto pokrajine oblikuje več gradnikov, procesov in pogledov, ki se med sabo prepletajo. Identiteta prostora se nenehno oblikuje in spreminja z različnimi odnosi med njenimi sestavnimi deli (Massey, 2004). To je t. i. »odnosni« prostor (angl. *relational space*), ki ga ni mogoče enostavno razmejiti. Sestavljajo ga povezave med različnimi prostori in različnimi časovnimi obdobji (Graham, Healey, 1999). Podeželje občine Izola z drugimi prostori in časovnimi obdobji povezujejo vmesniki (oljčniki, vinogradi, obdelovalne terase, tradicionalne jedi, turistične brošure, tematske poti, raba tal).

Z drugimi prostori so povezani oljčniki in vinogradi, obdelovalne terase, tradicionalne jedi, turistične brošure in tematske poti. Oljke, vinsko trto, obdelovalne terase in tradicionalne jedi povezuje Sredozemsko morje, ki omogoča, da se prebivalci Sredozemlja na kateri koli izmed njegovih obal nikoli ne počutijo kot tujci. Povsod jih namreč spremljajo poznane jedi na krožnikih, enaki letni časi in značilna pokrajina (Braudel, 1979 v Loumou, Giourga, 2003, 89). Podobne povezave so turistične brošure za obiskovalce (Paasi, 2013, 1212). Za promocijo turizma se večinoma uporabljajo naravne vrednote. Ne opisujejo identitete pokrajine, ampak njeno sliko. Opisi v brošurah niso namenjeni domačinom, ki se nahajajo v pokrajini, ampak obiskovalcem izven te pokrajine (Paasi, 2013, 1212). To je še ena potrditev, da je dojemanje pokrajine drugačno, če se nahajamo v njej ali izven nje (Relph, 1976). Obiskovalcem (pa tudi domačinom) so namenjene tematske poti. Podeželje občine Izola je sicer ciljno območje bližnje rekreacije prebivalcev Kopra in je zaradi razpršenih naselij in razgleda privlačno za sprehode (Jeršič, 1998, 39). Atributi podeželja (sonce, razgled, oljke) so preoblikovani v nove proizvode – v tematske poti.

Z drugimi časovnimi obdobji (preteklostjo) podeželje občine Izola povezujejo tradicionalne jedi, raba tal in obdelovalne terase. Hrana je pogosto več kot le hrana (Bessière, 1998). S krožnikom umešanih jajc z lokalnimi

sezonskimi zelišči se obiskovalcu ne ponudi le jedi, ampak tudi zgodbo Šavrinke in preko imena projekta še istrsko narečje. Iz analize sprememb rabe tal med dvema obdobjema je razvidno, da je povezava s preteklostjo lahko tudi raba tal in obdelovalne terase. Na nekaterih območjih je raba tal že 200 let enaka, na drugih pa se pogosto spreminja. Predmeti, ki se nahajajo drug ob drugem v prostoru, si niso nujno blizu tudi v času.

Nekateri vmesniki lahko povezujejo pokrajino z drugimi prostori in z drugimi časovnimi obdobji hkrati. Izguba takih povezav bi zato imela velik vpliv na spremembo identitete pokrajine. Takšne so obdelovalne terase in tradicionalne jedi. Z varstvom kulturne pokrajine in različnimi prireditvami se poskuša ohraniti te povezave. Status zavarovanega območja pa še ne pomeni, da je ohranjanje uspešno. Do podobne ugotovitve so prišli tudi pri proučevanju spreminjanja rabe tal v kulturni pokrajini v okolici Madrida. S primerjavo rabe tal na in izven zavarovanega območja so ugotovili, da je na zavarovanem območju bila počasnejša rast intenzivnega kmetijstva, hitrejše pa je bilo opuščanje zemljišč (Ruiz-Benito et al., 2010). Varovanje in s tem povezana birokracija lahko marsikoga, ki bi želel ohraniti oziroma narediti nove terase, od tega odvrne. Na takšen način lahko z varovanjem tudi uničimo tisto, kar varujemo (Lowenthal, 2015).

V »odnosnem« prostoru so prostori povezani med sabo. Identiteta ni samo tisto, kar v pokrajini vidimo, sestavljajo jo tudi povezave. Z izginjanjem povezovalnih elementov (na primer obdelovalnih teras) se spreminjajo funkcije in izgubljajo povezave, s tem pa se spreminja tudi identiteta pokrajine. Glede na trend upadanja kmetijskih zemljišč lahko v prihodnosti pričakujemo njihovo nadaljnje zmanjševanje. Zavarovan je že zelo velik del občine, nekateri deli tudi večkrat, zato tu v prihodnosti ne moremo pričakovati velikega povečanja ali zmanjšanja. Povečanje pa lahko pričakujemo pri potrošnji. Obstoječe tematske poti in projekti so namreč le ena od možnosti za uporabo atributov podeželja v turistične namene.

SKLEP

Istrska pokrajina ni več toliko pokrajina »velikih motik in pridnih rok« (Urbanc, Juvan, 2012, 311), ampak vedno bolj pokrajina trženja in prodaje njenih izginjajočih in novih, umetno ustvarjenih, atributov. V idiličnih opisih iz turističnih brošur sicer prepoznamo istrsko pokrajino, a to ni pokrajina, kot jo lahko vidimo danes, ampak podeželje, kot si želimo, da bi bilo. Takšno različno dojemanje pokrajine lahko vodi tudi v konflikte interesov. Nadaljnje raziskave bi se zato lahko osredotočile na vpliv vmesnikov, preko katerih dojemamo pokrajino (mediji, interesi, stereotipi, dogovori, izobrazba, čustva, namen, spomin), na konflikte interesov v pokrajini.

CHANGING FUNCTIONS AND IDENTITY OF THE ISTRIAN RURAL LANDSCAPE

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SUMMARY

Tourist brochures often present rural Istrian landscape as an idyllic place. In their descriptions they usually mention agricultural elements of landscape (eg. vineyards, olive groves, agricultural terraces, hard-working farmers). On the contrary, the identity of contemporary rural areas is shaped by a mix of production, protection and agriculture. We were interested in the relations among these three functions in rural areas of Izola municipality in the present and in the future and on the influence of these relations on the identity of rural areas. We analyzed a variety of spatial (GIS) and statistical data from different sources. The analysis has shown that the three functions are not in balance. We confirmed that agricultural terraces are being abandoned in areas that were made to protect them. By using Lidar data we also calculated their area (128 ha), but overestimated it, due to the method used. Rural areas are characterized by many relations to other spaces and time periods. This is the so-called relational space. Rural areas in Izola municipality are connected to Mediterranean (with vineyards, olives, terraces, and food) and to other regions (with thematic trails and brochures). They are also connected to past time periods. If the elements that create these connections disappear, the landscape identity changes. Istrian landscape is not a landscape of »big hoes and hard-working hands« (Urbanc, Juvan, 2012, 311) anymore. It is more a landscape of protection and disappearance. The brochures do not describe the rural landscape as it is now, but a rural landscape as we all wish existed.

Keywords: multifunctional rural areas, agriculture, consumption, protection, identity, Izola municipality

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HERITAGE TOURISTSCAPES: A CASE STUDY OF THE ISLAND OF HVAR

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ABSTRACT

The paper examines conflicts between the ideas of heritage and tourism, and advocates sustainable approach to tourism planning in cultural landscape. The research introduces heritage urbanism as a sustainable method for enhancing the role of heritage in tourism as a local development tool, stressing that active use of cultural landscape in tourism can bring about positive response to global competitiveness and development of a tourist site, regarding its positive influence on destination recognition and heritage revitalization. A case study carried out on the Croatian Island of Hvar investigates this tension between the preservation of the existing landscape's character and change.

Keywords: Island of Hvar, cultural landscape, heritage urbanism, sustainable tourism

IL PATRIMONIO TOURISTSCAPE: UN CASO STUDIO NELL'ISOLA DI HVAR

SINTESI

Il presente contributo esamina i conflitti fra il turismo e il patrimonio storico-culturale e propone una pianificazione turistica del paesaggio culturale come approccio sostenibile al problema. La ricerca presenta heritage urbanism, come un metodo sostenibile che promuove e potenzia il ruolo del patrimonio culturale nel settore del turismo come strumento di sviluppo locale, sottolineando che un uso attivo del paesaggio culturale in ambito turistico può portare benefici per la competitività a livello globale e per lo sviluppo locale dei siti turistici, sia in termini di influenza positiva per l'immagine e la riconoscibilità dei luoghi, sia per la rivitalizzazione stessa del patrimonio storico. Il caso studio dell'isola di Hvar indaga questa tensione fra la conservazione del carattere paesaggistico e i cambiamenti in atto.

Parole chiave: Isola di Hvar, paesaggio culturale, patrimonio urbanistico, turismo sostenibile

INTRODUCTION - LANDSCAPE, TOURISM AND IDENTITY

Landscape has been seen as one of the most important kinds of locations in environmental conservation (Jacobsen, Steen, 2007). It is through landscape that one can understand about the origin, identity and about who we are (Shuib, Hashim, 2011). For many countries, in addition to aspects of architecture and settlement, landscape could play a significant role in determining the identity of the place.

People interpret the term 'cultural landscape' in different ways. A cultural landscape, as defined by the World Heritage Committee, is the cultural properties that represent the combined works of nature and of man (World Heritage Convention, 1992). A landscape can be designed and created intentionally by man, or it can be an organically evolved landscape which may be a relict (or fossil) landscape or a continuing landscape, or an associative cultural landscape which may be valued because of the religious, artistic or cultural associations of the natural element. This definition reflects the idea that cultural landscapes evolve and change over time, because of being acted upon by natural forces and human beings (culture). It also underlines that a landscape forms a whole, in which the natural and cultural components are taken together, and not separately (European Landscape Convention, 2000, 1). The cultural landscape idea embraces urban areas, including historic towns and cities – or parts of these – as well as rural areas (Taylor, Lennon, 2011, 540).

On the other hand, the concept of cultural tourism is a very complex one and the definitions of this term are numerous. Cultural tourism can be defined as the activity, enabling people to experience the different ways of life of other people, thereby gaining first hand an understanding of their customs, traditions, the physical environment, the intellectual ideas and those places of architectural, historic, archaeological or other cultural significance, which remain from earlier times. Cultural tourism differs from recreational tourism in that it seeks to gain an understanding or appreciation of the nature of the place being visited (Charter for Cultural Tourism, 1997). This interest is profound and requires a certain level of skill, knowledge, conditioning, or experience (Stebbins, 1996, 948). Therefore, cultural tourism has implemented an educational value - a desire or an ability to perceive and learn about a place and its characteristics.

Comparing the definition of cultural landscape and the definition of cultural tourism, it can be concluded that cultural landscape is, in fact, a basic resource for the development of cultural tourism and that tourism always manifests itself in a space that contains certain natural and social attractiveness (Mrđa, 2015, 40). Consequently, the disappearance of the basic resource *in situ* is the inability for further 'exploitation'. This means that if you violate the core values and characteristics of the resource - the landscape, not only will the degree of attractiveness of the area decrease, but also the tourism itself will disappear.

In tourism development, the value and attraction of a space are important for maintaining and preserving the natural landscape, cultural beauties, and assets (Samsudin, Maliki, 2015, 433). According to the Brundtland Report, sustainable development is a development that meets the needs for the present without compromising the ability for future generations to meet their own needs[1].

Furthermore, it is recognized as having a great potential for bringing landscape conservation, tourism and economic development into a balanced and constructive relationship, as it is acknowledged that the neglect of important economic and social dimensions of heritage has in many cases led to the irreversible decay and destruction of heritage assets (Loulanski, Loulanski, 2015, 843).

Heritage, in its broader meaning, is generally associated with the word *inheritance*, that is, something transferred from one generation to another. Heritage, therefore, tends to concentrate on the power of identity and tradition, which implies stability or continuity, whereas tourism involves dynamic change (Hall, McArthur, 1993). Heritage tourism[2] is becoming a specific form of tourism, a type of tourism opposing the mass tourism (Picard, 1996). This is reflected in recent tourism trends of seeking novelty through a return to traditional social values, where new tastes and styles refer back to the past (Nuryanti, 1996). Within cultural tourism, and wherever else the production of authenticity is dependent on an act of (re)production, it is conventionally the past which is seen to hold the model of the original (Taylor, 2001, 9).

More recently, heritage has superseded conservation with change, where marketing of heritage as a product/resource according to the demands of the consumer, mainly tourists, has resulted in the commercialization of heritage over conservation values. Unfortunately, the pressure of the tourism development requirements often contradicts the needs of cultural heritage (Edson, 2004; Li et al, 2008).

Therefore, landscape changes pursuant to tourism are seen as a threat, a negative evolution, because the current changes are characterized by the loss of diversity, coherence and identity of the existing landscapes.

1 The definition is discussed in detail according to a few principles. The first principle is environmental sustainability to maintain theecological processes, biological diversity and biological resources. Furthermore, the other principle is social and cultural sustainability to maintain social and cultural identity in tourism sites. Finally, the last principle is the economic sustainability, which is important to help the efficiency of economy and to support future generations (Brundtland Report, 1987).

2 Heritage tourism is an important part of cultural tourism based on experiencing the places and activities that authentically represent historic, cultural and natural resources of a given area of region. In the focus of heritage tourism, it is heritage itself that mean such a cultural value from the past, which is worth to be maintained for the new generations (Csapó, 2012, 211).



Figure 1: UNESCO World Heritage Site - Pharos Hora (gr. ΦΑΡΟΣ ΧΩΡΑ), Island of Hvar, Croatia (source: Tourist Board of Split – Dalmatia County, http://www.dalmatia.hr/hr/kultura-i-zanimljivosti/stari-grad-starogradsko-polje).
Figura 1: Sito UNESCO patrimonio mondiale dell'umanità - Pharos Hora (gr. ΦΑΡΟΣ ΧΩΡΑ), Isola di Hvar, Croazia (fonte: APT di Spalato - Dalmazia, http://www.dalmatia.hr/hr/kultura-i-zanimljivosti / stari-grad-Starogradsko-Polje).

New elements and structures are introduced which look alike everywhere (Antrop, 2005, 22). On the other hand, landscapes always change because they are the expression of the dynamic interaction between natural and cultural forces. Moreover, landscape is not a picture that can be conserved (von Haaren, 2002, 73).

Today, the symbiosis of tourism and cultural landscape has become the major objective in the management and planning of tourist areas. This process must respect, protect and upgrade heritage, culture and identity. Cultural tourism, presented as a solution to these issues, rises more than tourism planning and management issues for developing destinations, they are fundamentally the problems of spatial development.

In that way, the concern for cultural landscapes should be upgraded from basic conservation and protection to the higher level of heritage planning and management. From the spatial planning point of view, it is highly important to integrate the possible scenarios of recognition, evaluation and protection of heritage places' identity into the planning process, to create a new evaluation model that will trigger a new method of specific planning approach.

In order to survive, tourist destinations must be globally competitive as well as locally recognized. Special features, attractiveness and spatial recognisability together with the characteristics of a tourist destination are the benefits underlying tourist offer and demand. Uncontrolled and unplanned tourism activities lead to the reduction or disappearance of certain specificities, attractiveness, and spatial recognition. This emphasizes the necessity for implementing new methods for affecting the viability and competitiveness of a tourist destination's physical attractiveness (Mrđa, Bojanić Obad Šćitaroci, 2014, 214).

This research introduces heritage urbanism as a new sustainable method - a means of achieving balance between economic success, social equity and environmental preservation - such that enhances the role of place-based identity in tourism as a local development tool, stressing that the active use of cultural landscape in tourism can bring about a positive response to global competitiveness and development of a tourist site, regarding its positive influence on destination recognition and heritage revitalization. According to that, the aim of moving towards sustainability is not to have passive

stagnation and conservation, or do what the market demands - the goal is to achieve a dynamic, integrated and, most importantly, democratic and collaborative planning process of socio-environmental changes. It is necessary to have sound spatial planning that would ensure the control of environmental impacts and the social structure of society, and carefully exploit resources of inherited landscape.

In the end, the complex relationship between tourism and cultural landscape is revealed in the tension between preserving the character of the existing landscape and change. This tension between 'conservation' and 'exploitation' has formed the central argument for this paper.

CASE STUDY - THE ISLAND OF HVAR

The study area is the Island of Hvar, a Croatian island in the Adriatic Sea, classified as a big island (297 km2)[3] and located off the Dalmatian coast, lying between the islands of Brač, Vis and Korčula. Hvar is an unusual island in the area having a large fertile coastal plain and fresh water springs. Its hillsides are covered in pine forests, with vineyards, olive groves, fruit orchards and lavender fields in the agricultural areas. The climate is characterized by mild winters and warm summers with many hours of sunshine (The Town of Hvar, 2009).

The island has 11500 residents[4], which makes it the fourth most populated Croatian island. Hvar's location at the center of Adriatic sailing routes has long made it an important base for commanding trade up and down the Adriatic, across to Italy and throughout the wider Mediterranean. It has been inhabited since pre-historic times (one of the oldest inhabited island in 3500 BC), originally by Neolithic people whose distinctive pottery gave rise to the term Hvar culture, and later by the Illyrians. Ancient Greeks founded the colony of Pharos in 385 BC on the site of today's Stari Grad, making it one of the oldest towns in Europe (Gamulin, 2011, 394). They were also responsible for laying out the agricultural field divisions of the Stari Grad Plain, now a UNESCO World Heritage Site (Figure 1).

It is regarded as the sunniest Croatian island, with an annual average of 2726 hours of sun, and one of the most visited islands in Dalmatia with 241843 tourist arrivals and 1464000 overnight stays in 2014 (Croatian Tourism in Numbers, 2014; First Release: Tourist Arrivals and Nights in 2014, 2015). Hvar is recognizable for its numerous bays, some of which are completely inhabited, and some reachable only by sea. Larger urban centers on the island include the town of Hvar, Stari Grad and Jelsa. Along the island's entire coastline and in the interior, there is a large offer of quality accommodation.

The vast majority of tourist accommodation facilities on Hvar fall into the category of private accommodation - 52%. Hotels and similar facilities account for 27%, campsites 13%, ports of nautical tourism 6%, and other accommodation facilities 2% of total accommodation capacities (Development Strategy of the Town of Hvar till Year 2020, 2015, 131).

The tourism development strategy on Hvar emphasizes the need for a greater control over the construction of new tourist facilities or the renovation and adaptation of the existing ones, as tourist suprastructure must not in any way violate the existing harmony and island's identity (Figure 2). Unfortunately, spatial planning documents at the local level have not been sufficiently harmonized with the above because the Island of Hvar, administratively part of Split-Dalmatia County, is divided into four autonomous municipalities, namely Hvar, Stari Grad, Jelsa and Sućuraj. There is a big problem with their harmonization and implementation. Because of fragmented tourism planning, based on individually defined tourist zones[5] without the regard for the totality of the island as a tourist destination, the area of the island has become degraded. Such administrative tourism planning is not in accordance with the principles of sustainable tourism nor with the postulates of cultural tourism.

Therefore, this paper seeks to prevent the loss of distinctiveness and identity of the island in tourism planning. A particular emphasis is put on the protection of natural resources and better management of space, the coastal belt, the sea, agricultural land and forests. Since the basic assumptions of the development of the island of Hvar (which must be preserved for sustainable development) are its outstanding natural features, cultural heritage, traditions and way of life, we argue that all of these elements should be also considered within the planned tourist zones and therefore these tourist zones should be reconsidered.

METHODOLOGY - EVALUATION OF CULTURAL LANDSCAPE

The purpose of the heritage urbanism methodology is to make an inventory of all available options for improving cultural identity of specific cultural landscapes. Landscape analysis is used as a means to describe cultural coherence and context in different investigation areas (Swensen, Jerpasen, 2008, 292), the ones preserved, and the ones overdeveloped. The research process of

3 Typisation of the island according to the physical characteristics established by Zimmerman in 1997. Inhabited islands of Croatia are divided into four groups: peninsulas and islands connected by a bridge, large islands - with more than 50 km2, medium-sized islands - 15 km2 to 50 km2, and small islands - 1 km2 to 15 km2 (Zimmerman, 1997).

4 Data from 2011 (Census of Population, Households and Dwelling 2011, Population by Sex and Age, 2013).

5 Planning of tourist micro locations / tourist zones - is very specific to individual buildings or complexes of buildings such as hotels, commercial centers and of tourist institutions. Most often, these are geographical areas that are planned for tourists, or integrated into separate tourist zones, tourist areas and tourist districts - Tourist Bubbles (Bosley, Brothers, 2008, 165).



Figure 2: Development of the town of Hvar between 1938 and 2010.
Figura 2: Sviluppo della città di Hvar tra il 1938 e il 2010.

the heritage urbanism methodology comprises the following stages:

Factors of heritage identity

The first stage is based on the acknowledging the factors of heritage identity. The result can be a static model of significance - factors of aesthetic, historic, and/or natural values - with difficulty of conceiving of the landscape's cultural dynamics as a whole (Stephenson, 2008, 128).

Therefore, here we determine the distinctive features of cultural landscape using the selected examples of 38 tourist zones (Table 1) provided in the spatial plans[6] for the island of Hvar (10 in the town of Hvar, 19 in the municipality of Jelsa, 6 in the town of Stari Grad and 3

6 The data used for the catalog are from: Spatial Plan of the Town of Hvar which was adopted in 2007 (amendment in preparation), Spatial Plan of Jelsa Municipality which was adopted in 2008, Spatial Plan of the Town of Stari Grad which was adopted in 2007 (amendments adopted in 2013) and Spatial Plan of Sućuraj Municipality which was adopted in 2008 (amendments adopted in 2012).

Table 1: List of analyzed tourist zones on the Island of Hvar.
Tabella 1: Elenco delle zone turistiche analizzate sull'isola di Hvar.

No.	Title	Settlement	City / County	Label (on the island map)
1	Jagodni bad	Sveta Nedjelja	Hvar	H-H-1
2	Plaža 1	Malo Grablje - Zaraće	Hvar	H-H-2
3	Plaža 2	Malo Grablje - Zaraće	Hvar	H-H-3
4	Vira	Hvar	Hvar	H-H-4
5	Križna luka	Hvar	Hvar	H-H-5
6	Gradska luka – Majerovica	Hvar	Hvar	H-H-6
7	Mala Garška	Hvar	Hvar	H-H-7
8	Pokonji Dol	Hvar	Hvar	H-H-8
9	Milna	Milna	Hvar	H-H-9
10	Sv. Nedilja	Sveta Nedjelja	Hvar	H-H-10
11	Zarače	Gdinj	Jelsa	H-J-1
12	Raskovica	Zastražišće	Jelsa	H-J-2
13	Makarac	Jelsa	Jelsa	H-J-3
14	Carkvica	Jelsa	Jelsa	H-J-4
15	Zenčišće	Jelsa	Jelsa	H-J-5
16	Soline	Vrboska	Jelsa	H-J-6
17	Soline	Vrboska	Jelsa	H-J-7
18	Gromin Dolac	Gromin Dolac	Jelsa	H-J-8
19	Žutica	Zavala	Jelsa	H-J-9
20	Petrovac	Zavala	Jelsa	H-J-10
21	Ivanković	Ivan Dolac	Jelsa	H-J-11
22	Mina - kamp	Jelsa	Jelsa	H-J-12
23	Mina - kamp	Jelsa	Jelsa	H-J-13
24	Mina – turističko naselje	Jelsa	Jelsa	H-J-14
25	Mina – turističko naselje	Jelsa	Jelsa	H-J-15
26	Mina – hotel	Jelsa	Jelsa	H-J-16
27	Fontana - hotel	Jelsa	Jelsa	H-J-17
28	Fontana – turističko naselje	Jelsa	Jelsa	H-J-18
29	Vrboska - hotel	Vrboska	Jelsa	H-J-19
30	Jurjevac	Stari Grad	Stari Grad	H-SG-1
31	Helios	Stari Grad	Stari Grad	H-SG-2
32	Stari Grad 1 – Zogonke	Stari Grad	Stari Grad	H-SG-3
33	Stari Grad 2 – Široki rat	Stari Grad	Stari Grad	H-SG-4
34	Stari Grad 3 – Brizenica	Stari Grad	Stari Grad	H-SG-5
35	Borova 1	Stari Grad	Stari Grad	H-SG-6
36	Mačak	Sućuraj	Sućuraj	H-S-1
37	Mlaska	Sućuraj	Sućuraj	H-S-2
38	Mrtinovik	Selca kod Bogomolje	Sućuraj	H-S-3

in the municipality of Sućuraj). These tourist zones are areas planned for tourism development - T1 (hotels), T2 (villas) or T3 (camp) (Figure 3).

Based on the field research[7] and available materials, i.e. based on the comparison and analysis of the existing state and the spatial planning documentation

7 Field research conducted in August 2014.



Figure 3: Map of analyzed tourist zones on the Island of Hvar.
Figura 3: Carta delle zone turistiche analizzate sull'isola di Hvar.

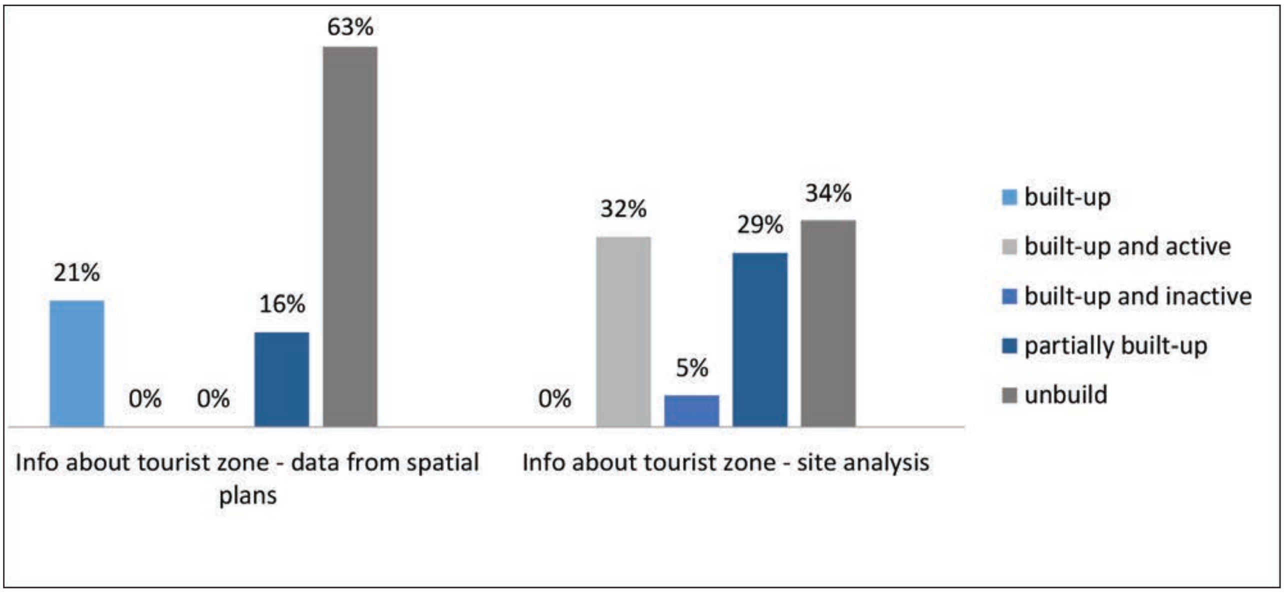


Diagram 1: Comparison of on-site and planning documentation of the state of tourist zones on the Island of Hvar.
Diagramma 1: Confronto in loco e nella documentazione di pianificazione dello stato delle zone turistiche sull'isola di Hvar.

of selected tourist zones on the Island of Hvar, we made a graph showing the discrepancies or inconsistency of data (Figure 4). Due to the on-site analysis results, some of the analyzed zones are already built-up and in use (32%), some are build-up but unused (5%), some are partially built (29%) and some are unbuilt (34%) (Diagram 1).

The following is to map and recognize the cultural landscape identity factors on the selected zones, which can show that even these zones, amended to be built up and become tourist suprastructure, have certain heritage value and need to be planned within the site-specific heritage criteria. It is done by fieldwork and taking photographs as surrogates to the real cultural landscape.

Table 2: Criteria for the evaluation of tourism resources.
Tabella 2: Criteri per la valutazione delle risorse turistiche.

Criteria for the evaluation of tourism resources					
Topic	Score				
	1	2	3	4	5
Authentic heritage scenery (cultural vitality)	Authentic heritage scenery modified in general	>	>	>	Authentic heritage scenery preserved at large preserved at large preserved at large
Authentic natural landscape (environmental responsibility)	Natural value of landscape does not exist	>	>	>	Natural value of landscape is very high
Sense of a socio-cultural setting (social equity)	Socio-cultural value does not exist	>	>	>	Socio-cultural value is very high
Activation of a site for a tourist use (economic health)	Tourist use is not possible	>	>	>	Tourist use is very likely to happen

The recognition of cultural landscape variety of the Island of Hvar is based on these photographs, mapped using GPS and put to a classification process. The aim of the classification process is to identify and select the most distinguished differences – or the site-specific identity. Many photographs were taken on-site[8], depicting detailed and broad landscape characteristics of the location. Out of these, the best photographs, which can represent different factors of cultural landscape heritage identity, are finally selected for the evaluation process.

Evaluation process

The role of the heritage urbanism method is to identify and classify specific heritage characteristics, which are then compared against the valorization criteria. The selected photographs are compared with each other[9] in a form of questionnaire, with the aim of determining permissible development interventions in the tourist area, and the needed level of preservation.

Based on the valorization criteria, respondents give their statements about cultural landscape values[10] in order to control and coordinate the professional[11] opinion and make data tribunal. The process is designed to enable systematic arrangement of responses, using a format that allows respondents to give their answers on a scale from 1 (the lowest value) to 5 (the highest value). The rating step is set according to certain valorization criteria (Table 2) in order to display the value of the cultural landscape and herein possibilities for integration in the tourism plan and the optimal level of cultural landscape use.

To ensure the effective planning and management of future landscapes it is therefore necessary to understand how people perceive their environment (and changes in it) and to have public support (Vos, Meekes, 1999, 13). Tourists can discover places unsuspected - many times strangers need to introduce the places to the inhabitants[12]. Therefore, the evaluation procedure is divided into the professional part and the non-professional part (Owens, Cowell, 2002, 74), (to establish the framework for public opinion pooling - visitors, local community, city government, tourist associations, etc.), pursuant to which the given objective evaluation conclusions for heritage as a tourism resource are taken.

In evaluative approaches, integration means considering the dynamic interaction between different context dimensions, being able to combine the existing relationships and explore potentials to build new ones. Context peculiarities suggest that the most appropriate in-

8 The photographs were taken on all 38 locations designated in the spatial plans as a tourist zones.
9 Mutual evaluation identified and classified resources within the study area.
10 Arising from the evolving meanings of culture and values, cultural values are taken to be those values that are shared by a group or community, or are given legitimacy through a socially accepted way of assigning value (Stephenson, 2008, 129).
11 Professionals are considered in the field of architecture and urban planning.
12 A produce became the symbol of a country and its land context. If this context is known and preserved in every cultural features (from the monuments to the traditional uses of fellow citizens), helps the produce to become unique against global competition (Del Lungo et al., 2015, 97).

Table 3: First set of photos used for the study.
Tabella 3: Prima serie di foto utilizzato per lo studio.



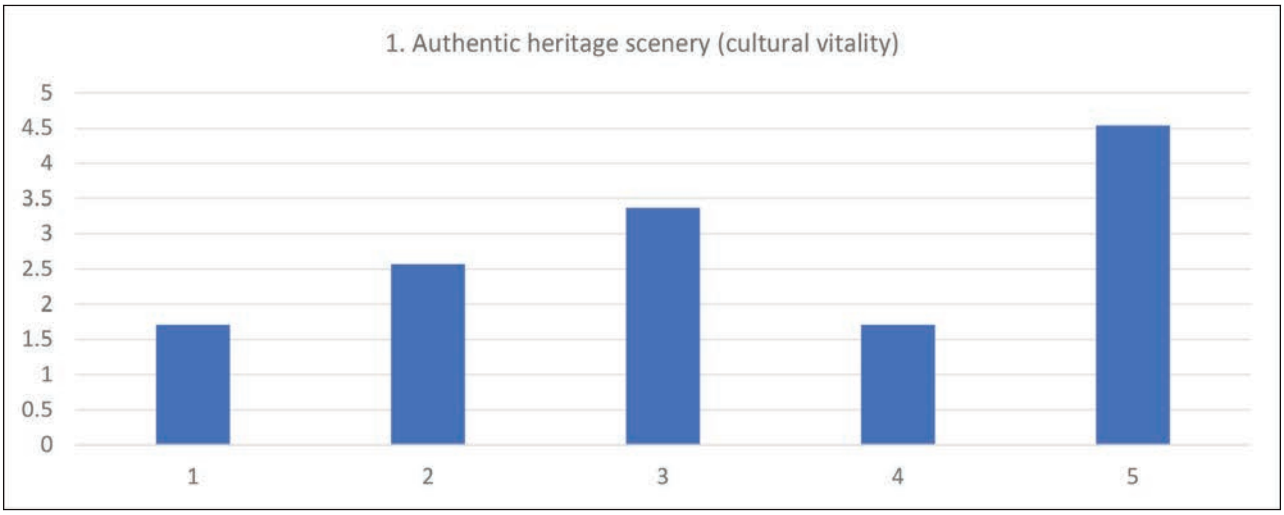


Diagram 2a: First set of photos - answers by professionals.
Diagramma 2a: prima serie di foto - risposte dei professionisti.

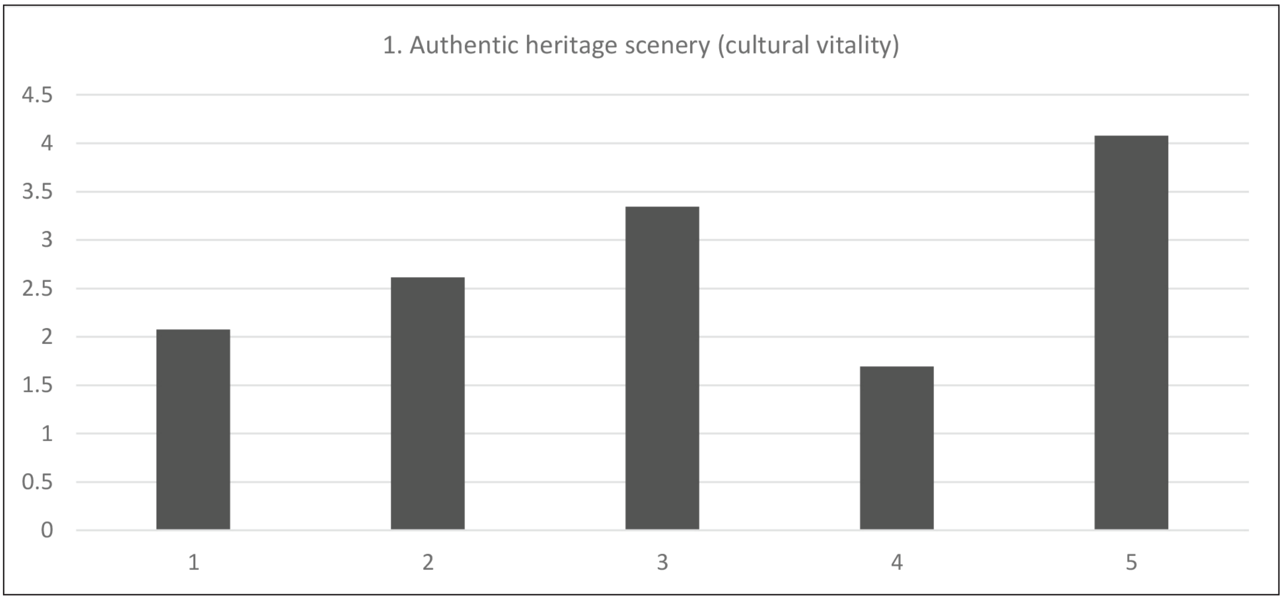


Diagram 2b: First set of photos - answers by non-professionals.
Diagramma 2b: prima serie di foto - risposte dei non professionisti.

tegrated approach depends on examining the decision process and how to structure and conduct it (Cerreta et al., 2015, 580).

Valorization criteria

The European Landscape Convention from 2000 suggests that there may exist shortcomings in the identification of landscapes' cultural significance, and that better attention should be paid to how to sustain the landscape's contribution to cultural identity and diversity. The concept of sustainable development is widely interpreted as a need to achieve sustainability concurrently within environmental, economic, social and cultural spheres (The Mediterranean Strategy for Sustainable Development, 2005). According to that, the complexity of the cultural landscape is expressed in four main components: natural, cultural, social and economic. Natural complexity is largely represented by forest remnants and by an unbuilt area. Cultural and social complexity is intimately linked to the diverse human use of resources and to a wide spectrum of land use. Economic complexity is linked to the diversified use of local resources (Farina, 2000, 313). Therefore, valorization criteria (Table 2) are based on the state of:

- Authentic heritage scenery (cultural vitality),
- Authentic natural landscape (environmental responsibility),
- Sense of a socio-cultural setting (social equity), and
- Activation of a site for tourist use (economic health).

RESULTS

Five hundred photographs were taken on the Island of Hvar at 38 locations designated as tourist zones in spatial plans - T1 (hotels), T2 (villas) or T3 (camp). Out of these, 20 were selected for the questionnaire. The questionnaire aimed at determining the island's cultural landscape identity relying on respondents' comprehensions based on photographs.

A total of 91 respondents participated, 48 male and 43 female. There were 65 architects and urban planners and 26 other professions. Regarding the familiarity with the area, 10 respondents are very familiar with the research area, 50 know the area and 25 of them are completely unfamiliar with the area.

Four themes characterized their values, as interpreted below:

1. Authentic heritage scenery (cultural vitality)

The task was to evaluate the authenticity of the heritage scenery proposed by the following photographs using numeric values from 1 (Authentic heritage scenery modified in general) to 5 (Authentic heritage scenery preserved at large) (Table 3).

The concern with authenticity in tourism destinations like these is also a concern with place identity (Jamal, Hill, 2004, 362). Photographs used for this theme showed a tourist zone with private tourist apartments, rooms, rentals or vacation homes built without the mandatory urbanism detailed plan[13] directly on the beach (Table 3 - No. 1), a tourism resort/settlement with apartments and bungalows planned and built near the beach (Table 3 - No. 2), a traditional vacation home in a rural agricultural setting built far from the beach (Table 3 - No. 3), a hotel built near the beach with a new artificially designed beach/pool (Table 3 - No. 4) and a hotel built within the old town settlement without a beach (Table 3 - No. 5).

Both professionals and non-professionals (Diagram 2a & 2b) confirmed that the photograph showing the urban - old town settlement (Table 3 - No. 5) was the most authentic heritage scenery, followed by an isolated vacation home in a rural setting (Table 3 - No. 3). Thus, these groups of respondents valued both the traditional urban and the rural setting as authentic cultural landscapes from an aesthetic point of view, but also as having the dominant heritage value.

In contrast, photographs that both groups strongly described as authentic heritage scenery modified in general were a contemporary redesigned hotel (Table 3 - No. 4) and a rent-a-room non-planned settlement (Table 3 - No. 1). If that is to be discussed, it is interesting that a dwelling such as a hotel has its long history in tourism and due to that should be encountered as a tourism heritage, but it seems that this biggest economic corporative provider seen from respondents' eyes has no or little heritage authenticity.

Heritage sustainability can be characterized by ensuring the continuing contribution of heritage to the present through the thoughtful management of change responsive to the historic environment and the social and cultural processes that have created it (Tunbridge, Ashworth, 1996). Put like that, for the cultural vitality of the island it is important that we design and create new tourist sites in accordance with and respecting the existing peculiarities of the cultural landscape.

2. Authentic natural landscape (environmental responsibility)

The task was to evaluate the authenticity of natural landscape proposed by the following photographs using numeric values from 1 (Natural value of landscape does not exist) to 5 (Natural value of landscape is very high) (Table 4).

The five photographs used for the second theme emphasized natural and ecological systems. Photographs

13 Some of them are even built without building permit.

Table 4: Second set of photos used for the study.
Tabella 4: Seconda serie di foto utilizzate per lo studio.



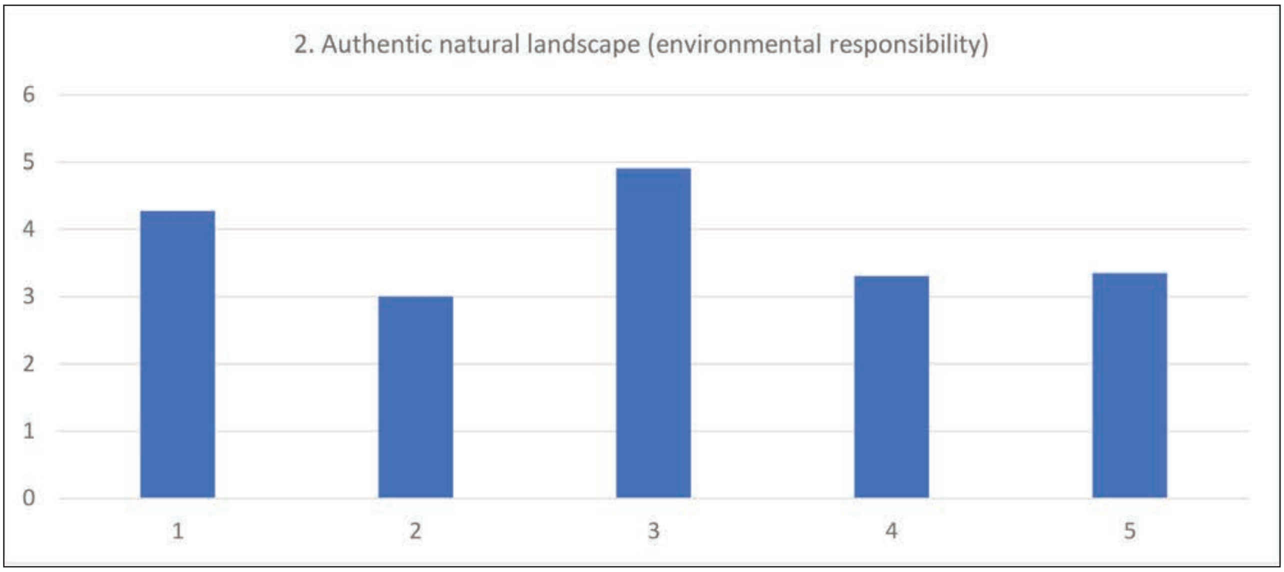


Diagram 3a: Second set of photos - answers by professionals.
Diagramma 3a: Seconda serie di foto - risposte dei professionisti.

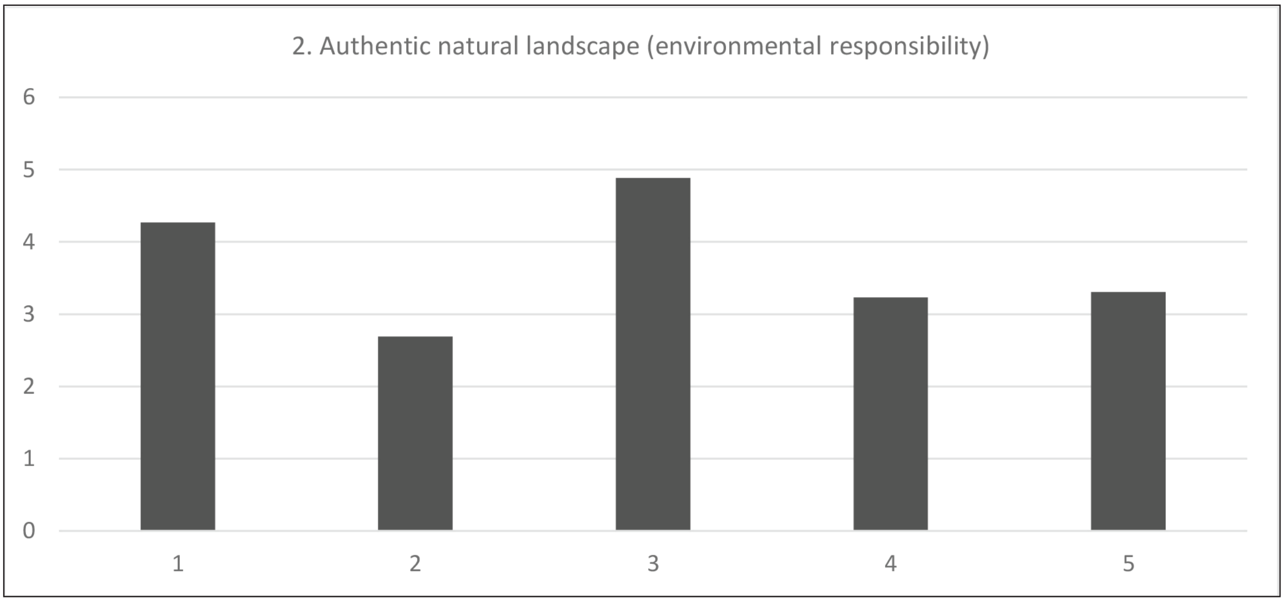


Diagram 3b: Second set of photos - answers by non-professionals.
Diagramma 3b: Seconda serie di foto - risposte dei non professionisti.

Table 5: Third set of photos used for the study.
Tabella 5: Terza serie di foto utilizzate per lo studio.



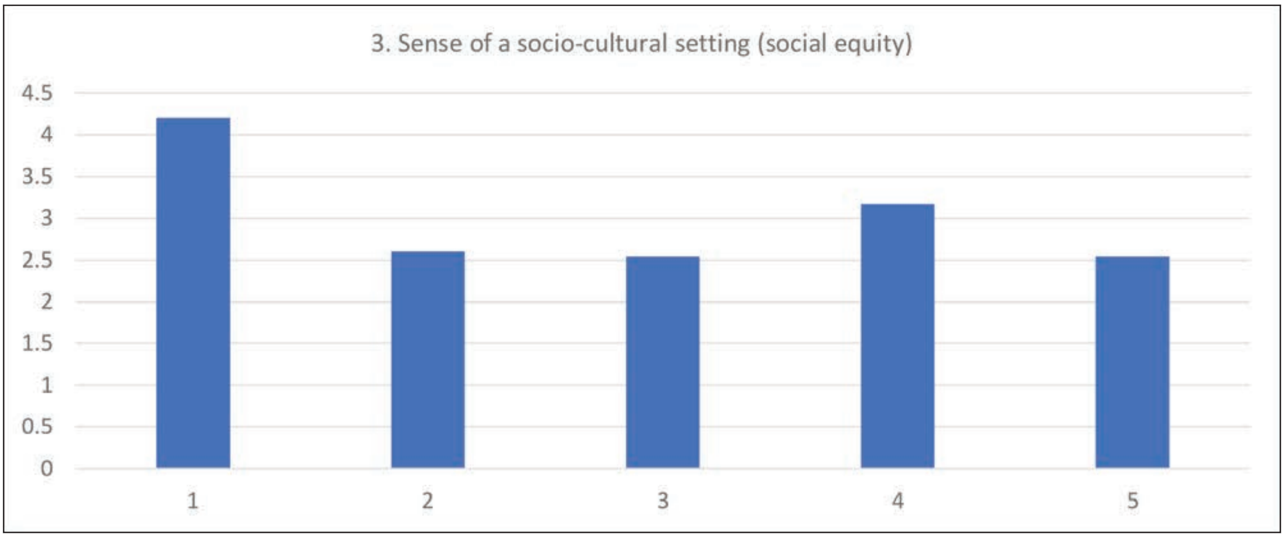


Diagram 4a: Third set of photos - answers by professionals.
Diagramma 4a: Terza serie di foto - risposte dei professionisti.

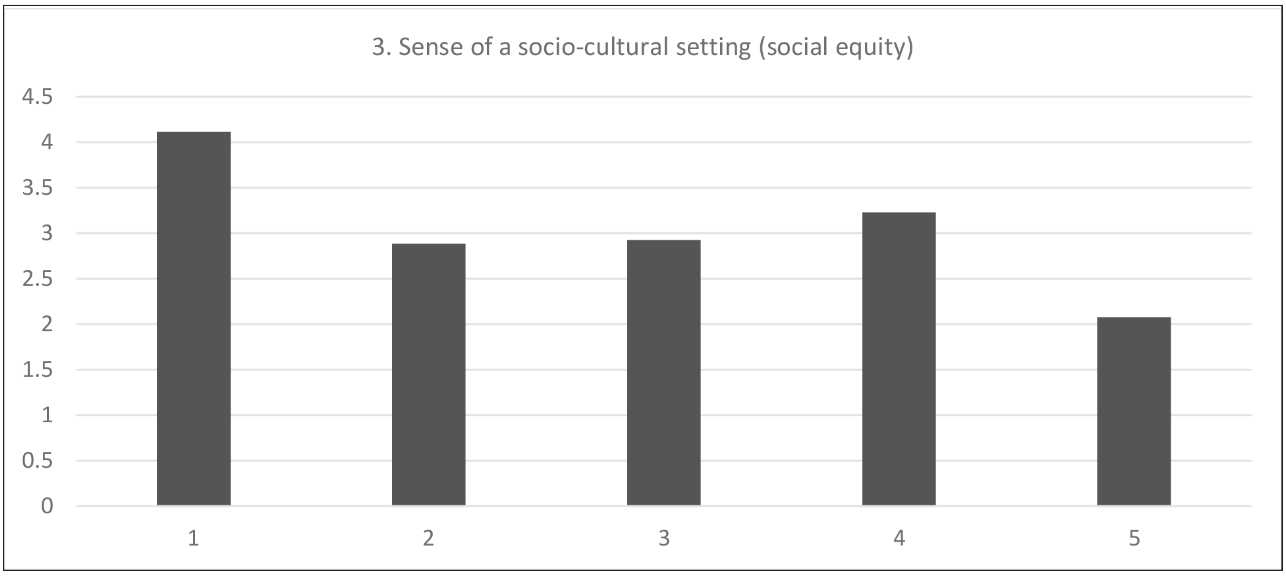


Diagram 4b: Third set of photos - answers by non-professionals.
Diagramma 4b: Terza serie di foto - risposte dei non professionisti.

showed an unbuilt tourist zone used as agricultural land (Table 4 - No. 1), a tourist zone developed into a camping site (Table 4 - No. 2), an unbuilt tourist zone covered by forest (Table 4 - No. 3), a tourist zone used as an organized and designed beach[14] (Table 4 - No. 4) and a tourist zone partially developed into private tourist apartments and rentals (Table 4 - No. 5).

For example, both professionals and non-professionals (Diagram 3a & 3b), rated photographs of the unbuilt area showing the forest and the undiscovered coastline (Table 4 - No. 3) and the rural setting with vineyards (Table 4 - No. 1) to be authentic natural landscape, both pleasing and in harmony with nature.

In contrast, these groups considered the photograph of the camping site (Table 4 - No. 2) to have less natural value of the landscape. Not far from being the landscape with low natural value are also the photographs of the organized beach (Table 4 - No. 4) and tourist apartments (Table 4 - No. 5).

Man-protected natural scenery as if the man made rural scenery was marked as the most potent and appealing. On the other hand, cultivated scenery with little tourism infrastructure is less appealing and, in the end, the landscape with the fully developed tourist camping zone is the least valued cultural landscape. When we think of these zones as future hotels, resorts and camps, it seems that all of them lack something common - a good revision of the planned area zooning. It seems now that all these tourist zones are mainly planned with insufficient justification for planning proposals and the criteria of selection and dimensioning (Criteria for Planning Tourism Zones in the Coastal Area, 2009) with a lack of environmental responsibility.

3. Sense of a socio-cultural setting (social equity)

The task was to select the preferred socio-cultural setting based on the following photographs using numeric values from 1 (Socio-cultural value does not exist) to 5 (Socio-cultural value is very high) (Table 5).

Socio-cultural experiences characterized the perception and meanings presented in the third group of photographs were for respondents to evaluate. The five photographs selected for this topic are a hotel at the sea-promenade leading towards the old town (Table 5 - No. 1), a camping site area (Table 5 - No. 2), a popular beach area (Table 5 - No. 3), the historic beach area (Table 5 - No. 4) and a hotel with room balconies and common lunch terrace (Table 5 - No. 5).

Both professionals and non-professionals (Diagram 4a & 4b) confirmed that the photograph of the sea-promenade towards the old town settlement (Table 5 - No. 1) is rated with the highest socio-cultural value, with the historic beach area (Table 5 - No. 3) as the second best result. Thus, these groups of respondents valued only the traditional historic setting as their most valued cultural landscape from primarily cultural point of view but also having social components in their minds.

In contrast, photographs lacking socio-cultural value differ between professionals and non-professionals. The first group finds all other photographs - camp (Table 5 - No. 2), beach (Table 5 - No. 3) and hotel (Table 5 - No. 5) - more or less similar in lacking socio-cultural value. On the other hand, the second group of respondents strongly disliked only the photograph of the hotel (Table 5 - No. 5) whereas other images, of the camping site (Table 5 - No. 2) and the public beach (Table 5 - No. 3), are well rated. It seems that this group strongly valued the community significance of historic places and not the isolation of the solely tourist environment without locals - tourists interaction like the hotel, where tourists don't have insight into the real social component of the everyday island life and island community or, better to say, island's lifescape.

The unique expression of nature and culture within each landscape provides a backdrop against which people – mostly unwittingly – structure their own identity. We develop together with our landscape. It gives us a sense of place and reveals our relationship with the land over time (Maessen et al, 2008, 551). Lifescape can be defined as both a place and a process or as a branding of the landscapes in a means of the sense of the place. It is a question how social structures and social context affect the livelihoods of communities and, in turn, how these factors shape the use of natural resources and the potential to manage them well within a particular landscape. Protecting the identity of lifescapes is a powerful way for capacity building and enhancing the social capital leading towards upgrading the social equity of a tourist region.

4. Activation of a site for a tourist use (economic health)

The task was to evaluate the possibility for tourist use of the space proposed by the following photographs using numeric values from 1 (Tourist use is not possible) to 5 (Tourist use is very likely to happen) (Table 6).

Theme four showed strong preference for the cultural landscape possessing visual quality. The photographs used for this theme showed an undeveloped tourist zone with a bay and a forest (Table 6 - No. 1), an undeveloped tourist zone in the inner part of the island with no sea or beach view (Table 6 - No. 2), an old and abandoned military seaside resort in the old town bay (Table 6 - No. 3), a bay with a beach and infrastructure (Table 6 - No. 4) and an abandoned and degraded hotel integrated into cultivated natural surroundings (Table 6 - No. 5).

Professionals thinking (Diagram 5a) about the activation of a site for tourist use were thinking of a concept containing an attractive site for the construction of

14 With a tourist infrastructure.

Table 6: Fourth set of photos used for the study.
Tabella 6: Quarta serie di foto utilizzate per lo studio.



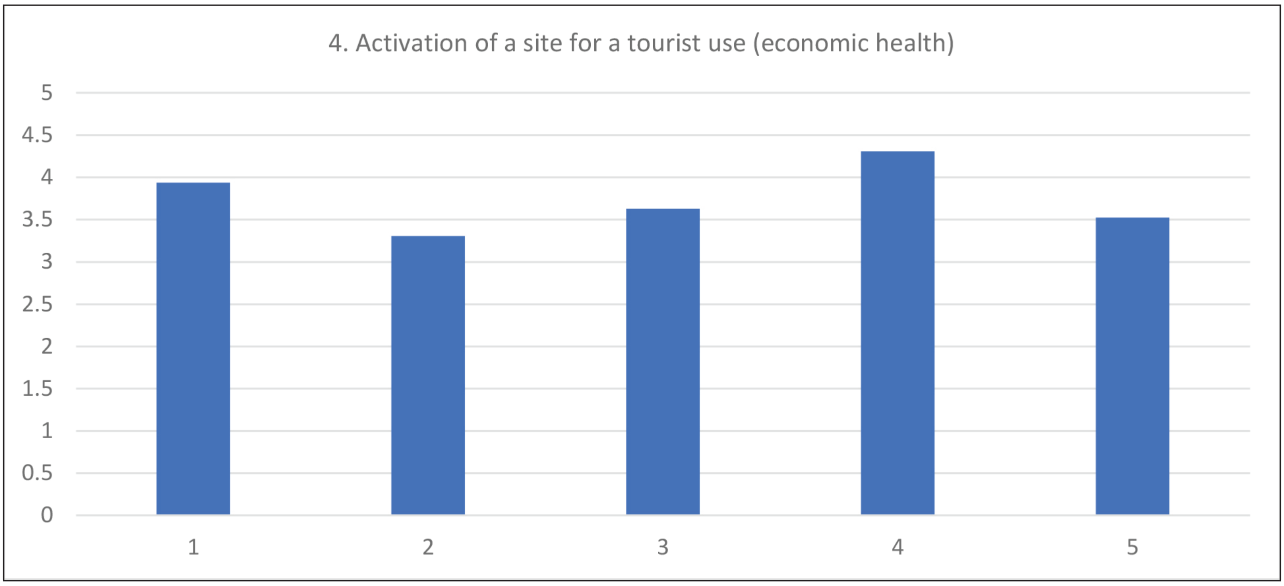


Diagram 5a: Fourth set of photos - answers by professionals.
Diagramma 5a: Quarta serie di foto - risposte dei professionisti.

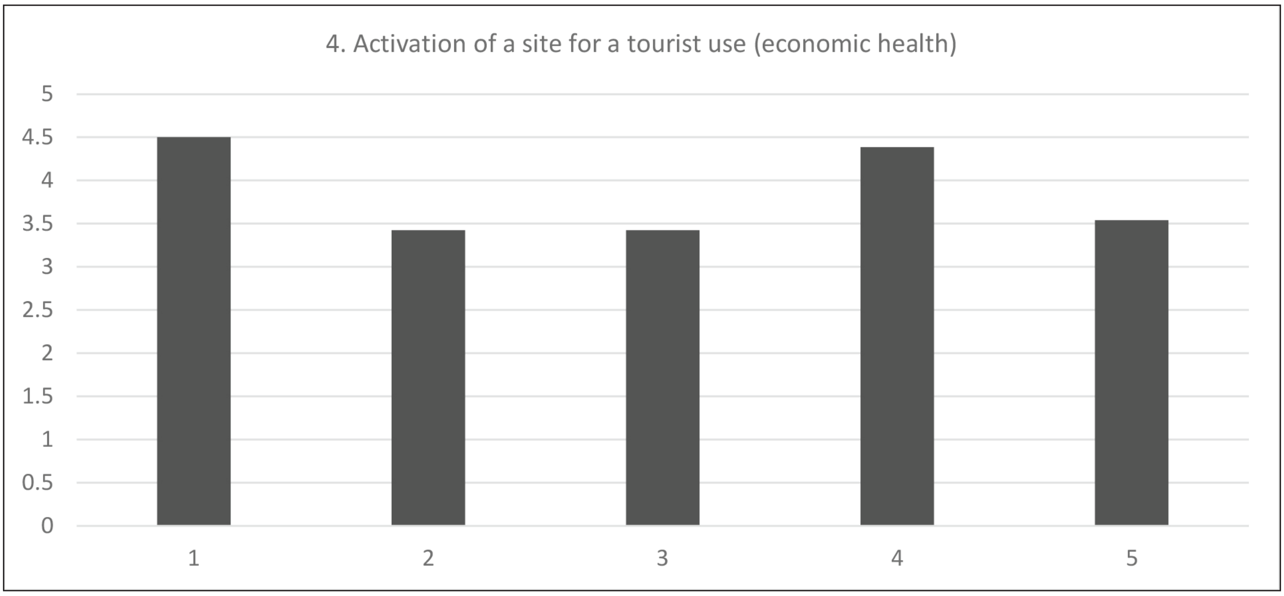


Diagram 5b: Fourth set of photos - answers by non-professionals.
Diagramma 5b: Quarta serie di foto - risposte dei non professionisti.

the area. Consequently, they evaluated the bay with the beach and infrastructure (Table 6 - No. 4) as the most potent. On the other hand, the second group of respondents (Diagram 5b), when thinking about the activation of a site for tourist use, was thinking about the idyllic image of the surroundings in which they would like to spend their holidays. Hence, they selected the image showing beautiful nature with a rural setting with a vineyard and a beach with clear blue water (Table 6 - No. 1) as the best selection.

In contrast, both groups agreed on all the rest of the photographs describing them 'tourist use is likely to happen'.

This questionnaire shows that the protection of cultural landscape is of utmost importance and that the construction of tourist accommodation facilities should not be planned without good evaluation of the area's identity and tourist potential. On the other hand, the existing abandoned buildings, whether built for tourist use or another purpose, are recognized also as having the potential for revitalization and use as future tourist accommodation facilities.

It is also interesting that all 25 respondents who are not familiar with the area mainly perceive cultural landscape as a place rich in social and cultural values and dislike the appearance of excessive resource exploitation. This kind of perception is consistent with the studies of community landscape values such as the ones reported by Kaufman (1997), Davenport and Anderson (2005) and Jacobsen and Steen (2007). The concept of 'place attachment' (Kaltenborn, Bjerke, 2002; Brown, 2005) relates landscape perception to actual places where people have interacted with and give meanings to such places. What the respondents not familiar with the area perceived as valuable are landscape properties that constitute the identity of the cultural landscape when viewed as a whole.

DISCUSSION - MODELS OF THE LEVEL OF THE INTERVENTION

The challenge for landscape managers and planners is to optimize the protection of diversity in a dynamic and multi-use landscape (Marignani et al., 2008, 35). The perspective focuses on the preservation of inherent landscape qualities and values. These are both natural resources and cultural heritage consisting of material objects in their landscape context and immaterial values such as the sense of place, the genius loci. Sustainable preservation of these qualities demands maintaining traditional practices and functions, and keeping the necessary knowledge to do so (Antrop, 2006, 193).

As presented, the cultural landscape of the Island of Hvar is not adequately taken care of in terms of protection, but also in terms of its potential for enhancement. The applied heritage urbanism methodology helps to locate the area of interest with a suitable competitive context. In fact, it can directly provide the planning criteria for new interventions and use of the cultural landscape. Only based on fieldwork and evaluation process site-specific criteria with the models of area level of intervention can be set.



Figure 4: Hvar, The Loggia and Clock Tower. Source: Wikimedia Commons.
Figura 4: Hvar, La loggia e la Torre dell'orologio. Fonte: Wikimedia Commons.

The main criteria for using the set of evaluation models are: 1) the long-term protection of the area in the form of cultural and natural values, 2) the preservation of value, specifics and identity of the area by evaluating and preserving heritage resources and attractions, and 3) the creation of socio-cultural and experiential aesthetic worthy and globally competitive tourism environment with positive effects on the state of the local community and local recognition.

These criteria can indicate through models the level of needed protection and conservation and most importantly the level of activation and use of resources - iden-

15 Value or meaning incorporates any or all of the following aspects: cultural, historical, traditional, artistic, social, economic, functional, environmental and experiential. The perspective on value or meaning should encompass the past, present and future.

tified potential. The models can be used as an obligatory instrument of heritage touristscape development. The suggested models determine the capabilities and limitations of preserving heritage characteristics and placing them in the role of tourism resources - determination of the island's further potential for tourism development.

All of the above-mentioned guidance can be complied in three basic models:

The protection model – Highly valued cultural landscapes are those in which the importance and sensitivity of resources/attractions are so large that the construction of tourism facilities would be violating their tourist value. The aim is to preserve the physical setting and its activities so that the value or identity of the place can be sustained[15].

The upgrading model – Moderately valued cultural landscapes are those in which strict spatial planning criteria can support tourism development for activating the existing resources/attractions. The aim is to increase the vitality of the physical setting and its activities by increasing the quality of the setting through structural changes in order to adapt or accommodate a new function or adapt old settings to new requirements.

The developing model – Lowly valued cultural landscapes are those in which the existing state is degraded and there is a need for revitalization and rehabilitation that will provide the basis for the implementation of the second model. The aim is to restore the condition of the physical settings and its activities in a degraded area, meaning to improve the condition by removing new/additional degrading elements to conform to the new setting or to the identity of a previous era.

It follows that further description is in hands of the professionalism and the possibility of preserving or activating the identified values (spatial planning rules for usage of resources) and in dialogue with the government, which institutions should systematize and control these values/resources/attractions. With an aim to evaluate the resources of certain areas which form now or in the future significant tourist attractions (Mrđa, Bojanić Obad Šćitaroci, 2015).

CONCLUSION

This research's analysis of tourist zone perceptions demonstrates the critical need to understand the makeup for better planning in cultural landscape conservation. The evaluation of heritage resources is necessary for defining the factors of space identity. Cultural landscape recognisability, authenticity and uniqueness (whether based on heritage, nature or lifescape) is essential in deciding what potential tourist destination areas are capable of.

In addition, as these resources are studied, spatial planning teams and local governments should be able to understand what it is that makes the cultural landscape special and valuable and should be better prepared to mitigate the negative impacts and promote the positive values to sustain and identify spatial solutions to the existing tourism problems.

Landscape no longer refers solely to the traditional rural countryside or to spectacular nature. Profound reorganization of the land to adapt to the changing societal needs has been resulting in rapid changes to our environment. Cultural tourism here has a potential to enrich our appreciation of the past and to forge stronger links between the past, the present and the future - a growing challenge as the pace of change accelerates. However, in a postmodern society, cultural tourism should challenge the visitor to experience in different ways than before. Paradoxically, the continuity of traditional values in tourism will require it to demonstrate an enhanced ability to change. The more cultural landscape enables one to anticipate and adapt to changes, the more powerful that touristscape becomes.

The purpose of this paper is to point out the importance of the factors and the valorization criteria of cultural landscape identity as a starting point for the new heritage urbanism planning method that can be of utmost importance in the area of cultural tourism.

Vacationscapes described as developing tourist areas (Gunn, 1972) are primarily connected with the image of uniformity, the lack of identity and the monofunctional tourist activity directly connected to the mass tourism concept. These homogenous tourist areas lack diversity in history, culture and natural assets. The perception of tourism has changed over time and there is no longer interest in such isolated tourist areas. New trends in tourism introduce the desire for acknowledging and respecting one's identity.

Perceptions of people give meanings to a place (Shuib, Hashim, 2011). Therefore it is not the same as we speak of touristscape, tourist place or tourist space. A tourist space is an area used predominantly by tourists, meaning that it is an area planned solely for tourist use and active only during the tourist season. On the other hand, a tourist place is a tourist destination that is sustained economically only on tourism. In the end, a touristscape should be different from these two examples because it is planned mainly for locals and primarily because of these local attributes (nature, culture, or other) interesting and appealing to tourists. 'Touristic landscapes' (Cartier, Lew, 2005) or touristscapes are described as places which get large number of tourists but which, in the end, are spaces in which people live and which have other functions, tourism being only one of them (Metro-Roland, 2011, 6). The touristscape is identified as a cultural landscape within its lifescape as a whole, strongly opposing the concept of a tourist bubble.

In the case of the Island of Hvar, the cultural landscape is recognized as the island itself. That means that the whole island must be planned as a unique touristscape, without isolated tourist zones (spaces and places). Cultural landscape should be approached in a dy-

namic manner, not as a collection of elements simply passed from the past to the present, but as a permanent creation aiming at responding to contemporary needs, such as sustainable tourism development.

A new approach by the heritage urbanism methodology based on landscape evaluation can be a part of an integrated method as a continuous and flexible planning method – which can justify or refute the existing, as well as evaluate and determine the potential of new tourist areas. It is a logical and systematic method based on the recognition of factors of identity, setting up cultural landscape valorization criteria and proposing the criteria and models of appropriate tourism development.

To conclude, heritage urbanism is a method of recognizing, preserving and activating cultural landscape for the sustainable development of tourism.

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DEDIŠČINA TURISTIČNE KRAJINE: ŠTUDIJA PRIMERA OTOKA HVARA

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POVZETEK

Raziskovalna analiza dojemanja turističnih destinacij skozi ilustrirani vprašalnik kaže kritično potrebo po razumevanju strukture izboljšanega planiranja v ohranitvi kulturne krajine. Ovrednotenje dediščinskih dobrin je nujno za določanje dejavnikov prostorne identitete. Prepoznavnost, avtentičnost in edinstvenost kulturne krajine (ki temeljijo bodisi na dediščini, naravi ali življenjski krajini) so bistveni pri odločanju o tem, česa so zmožne potencialne turistične destinacije. Poudarjene so tri izzivalne zadeve pri povezovanju dediščine in turizma s stališča urbanizma dediščine: 1) merila za valorizacijo kulturne krajine, upoštevajoč edinstvenost, avtentičnost in zmožnost kot ključne dejavnike, 2) merila za načrtovanje in upravljanje kulturne krajine, upoštevajoč načrtovanje scenarija in strateške napovedi, ter 3) novi modeli trajnostnega razvoja, ki zagotavljajo prednosti dediščinskega turizma. V skladu s tem, cilj pomikanja proti trajnostnemu turizmu ni pasivna stagnacija in ohranitev ali delovanje po zahtevah trga. Cilj je sicer doseči dinamičen, celosten in, najpomembneje, demokratičen in skupen postopek načrtovanja kulturnih, okoljevarstvenih, družbenih in gospodarskih sprememb.

Ključne besede: otok Hvar, kulturna krajina, urbanizem dediščine, trajnostni turizem

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RECOGNIZING AND FOSTERING LOCAL SPATIAL IDENTITIES USING A SUSTAINABILITY ASSESSMENT FRAMEWORK

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ABSTRACT

The paper discusses the importance of considering local identities for a successful retrofitting of neighbourhoods. We define the concept of the spatial identity in a relation to the framework of a neighbourhood and its characteristics through the metrics, used for evaluating performance or level of quality. Databased systems to support decision-making process in urban planning and gradual retrofitting are essential for achieving resilient cities or to successfully following the existent local identity as a quality. In the paper, we outline the on-going research that seeks for a reliable metrics to assess the characteristics of urban environments in terms of its efficiency and performance, as well as in terms of its spatial authenticity and celebrated identity on the level of neighbourhoods. Specifically, the research develops the evaluation model for Slovenian neighbourhood, based on the modular system of indicators and to it connected methodology for the interpretation of resulting values.

Keywords: spatial identity, urban design, sustainability, assessment model, neighbourhood

INDIVIDUARE E RAFFORZARE L'IDENTITÀ DEL QUARTIERE UTILIZZANDO UNA STRUTTURA DI SOSTENIBILITÀ DEL QUARTIERE

SINTESI

Il documento discute l'importanza di considerare l'identità basata sul luogo per un rimodernamento di successo nei quartieri. Viene definito il concetto di identità spaziale in relazione alla struttura di un quartiere e alle sue caratteristiche attraverso i criteri utilizzati per valutare le prestazioni o il livello di qualità. Per supportare il processo decisionale nella pianificazione urbana e nel rimodernamento graduale sono essenziali i sistemi delle banche dati per ottenere città resilienti o per adeguarsi con successo all'identità locale esistente intesa come valore. Nel documento si delineano la ricerca in corso che cerca criteri affidabili per valutare le caratteristiche di un ambiente urbano in termini di efficienza e di prestazioni, nonché nei termini della sua autenticità spaziale e di identità riconosciuta a livello di quartiere. In particolare, la ricerca sviluppa il modello di valutazione per un quartiere sloveno basato sul sistema modulare di indicatori e sulla metodologia ad esso connessa per l'interpretazione dei valori risultanti.

Parole chiave: identità spaziale, progettazione urbana, sostenibilità, modello di valutazione, di quartiere

INTRODUCTION

Rapid change in the appearance of places, urbanization, deagrarisation, and littoralization in coastal regions has brought the concept of the spatial identity intensely on the agenda of urban planning, urban design, and renewal. Along with the tendencies towards rational use of resources, and resilient solutions in urban planning/design, the aspiration for authenticity of places or landscapes has become even stronger.

We argue that in the face of challenges for preserving the place-related identities and boosting sustainable development in the built environments, the scale of a neighbourhood[1] plays an important role. The relation of the neighbourhood in its spatial terms with the community (in the societal terms) constitutes the integrity that reflects the interpreted identity. Essential for managing the expressions of local identity and achieving urban resiliency are the instruments based on data and information related to smaller spatial entities. The scale of the neighbourhood foresees better opportunities and a higher level of efficiency on diverse levels, including maintenance of built fond, preservation of cultural heritage or the approach to decision-making. Whilst often portrayed as a procedural matter, orchestrated through the top-down tenacities of government and major corporate actors, especially the shifts in the system of decision-making also entail efforts to fundamentally reconfigure relationships between the local community and policy-making authorities in a particular local reach. For the practitioner concerned with urban development, urban planning, and especially urban regeneration, including renovation of the built environment, the neighbourhood, always bear a strong physical cover (Blum, Grant, 2006). As such, the starting point of our perspective will be a smaller or larger ensemble of buildings with the in-between spaces and infrastructures, which undergo the retrofitting with the objective of greater levels of sustainability, by which preserving spatial identity shall have a distinguishable share.

In the paper, we outline our on-going research that seeks for a reliable metrics to assess the characteristics of urban environments in terms of its efficiency and performance, as well as spatial authenticity on the level of neighbourhoods. We gather, combine, and structure the indicators into a covering index of *sustainability performance*[2]. Specifically, the research develops the evaluation model for Slovenian neighbourhood, based on the modular system of indicators and to it connected methodology for the interpretation of resulting values. The envisioned instrument evaluates the potential of the neighbourhood for a sustainability performance within the diverse set of indicators through five crucial categories: energy efficiency, environmental efficiency, efficient organization and management of the built environment, communities' engagement level, and exploitation of ICT *(Information Communication Technologies)* solutions to foster other four categories of efficiency. Each of the categories is observed from the aspect of three strategic levels of implementation: (1) buildings or households, (2) public and in-between spaces, (3) traffic organization and infrastructure.

Such structuring introduces possibilities for evaluating neighbourhoods from the aspect of ecology and environment, built environment characteristics, appearances and functionalities, as well as activities, habits, attitudes and engagement of their inhabitants – all being crucial factors in achieving better performance and efficiency of cities and their parts, as well as preserving their existing spatial identity and bonds with the prior development.

The reason for addressing the issue at hand is a significant lack of instruments to collect data, track and assess different categories of sustainability in Slovenian neighbourhoods, with regard to standardized frame of criteria and indicators, which provide a basis for consistent tracking, comparability and targeted actions. As noted by Karol (2009), in the interests of sustainability, the pressures of urban development need to be mitigated and conventional development techniques changed to alleviate the impacts and damage. In our case, special concern goes to less explicit metrics. Given the necessities of smart and resilient retrofitting, the conception of preserving the place-based identity, for instance, turns out to be notoriously loose guideline. Similarly occurs with other scopes (categories) of assessment, somewhat substantial from the aspect of retrofitting and renewal. To provide a solid basis for the actions and interventions when retrofitting, evaluation methods should rely, as much as possible on quantifiable metrics and indicators that can be easily measured and tracked over time (Rashed-Ali, 2013), which means that even the expression of spatial identity as a quality, despite the elusive nature, must meet certain indicators to be measured with.

SPATIAL IDENTITY AS AN EXPRESSION OF QUALITY

The identity of a place, local identity, also referred to as geographical identity or a spatial identity all stand on similar bases. However, by all of them, there is one distinct division in the meaning of this concept.

1 The term *neighbourhood* is considered here a functional geo-unit (belonging to a certain settlement) of basic services and facilities gathered around dwelling activities – such neighbourhood represents a typical cornerstone of urban, sub-urban or rural settlement fabric in Slovenia.

2 The term sustainability performance index or sustainability index is used to facilitate the understanding of the concept and literally means the model of assessing sustainability efficiency based on the basic modular system of indicators and the related method of values interpretation.

On one hand, the identity of place represents the key characteristics with which a particular place (region, village, town, neighbourhood, public place, etc.) is associated. It is an expression of uniqueness[3] and authenticity. Spatial characteristics depend on the intertwinement of a large range of factors: from morphological features, vegetation, climate, built structures and infrastructures, historical character and existence of cultural heritage, land use patterns, to more indirectly visible, less tangible, such as inhabitants' habits and customs, governmental regulations or behaviour patterns. The numerous combinations and constant change of these factors bring additional complexity to this term. Lynch (1960) regarded identity as a part of the image of a city. Although the image of a city is not necessarily the same as its identity (Arreola, 1995), it is the physical and most instantly perceived reflection of its identity (Kaymaz, 2013), even if we neglect the subjective interpretation of it.

On the other hand, place identity is often referred to as a *sense of place*, *genius loci and* even *attachment to this place*[4]. This means that it is a subjective feeling or perception held by people and refers to a cluster of ideas about the place. It concerns the meaning and significance of places for their inhabitants and users, and how these meanings contribute to individuals' conceptualizations of self (Butina Watson, Bentley, 2007). Identity in this view is seen as a dynamic, social product of the interaction of the capacities for memory, consciousness, and organized construal (Lappagard, 2007). Such comprehension of the identity inevitably encompasses the individual subjective insight and implies one's identification *with* place.

The distinction in the comprehensions of the term is sometimes explained with the split between the objectively and subjectively perceived spatial realities and its identities (Relph, 1976). In terms of individual perception, the perceived identity of place is always leaned on subjective recognition of structures in space and developed with the strong impact of the community consensus, public views, media or collective memories[5]. Thus, the identity of a place is more than just the physical setting and appearance with the reflection of social activities and use but also involves a "meaning" for the individual and the community (Kayamz, 2013). Brought from the subjective perceptions, each place then has multiple identities (Relph, 1976); however, in this paper, we will rather refer to it as a multiple interpretations of it. The subsequent question whether *collective* or common perception of spatial identity is yet *objective,* we will leave aside for some other discussions.

Within this paper, we will refer to the identity of place in both discussed senses – as key characteristics of it and as a cluster of the ideas and meanings attached to it. Both seem to be inevitably related; however, here our primary focus is dedicated to the first, embracing the appearance with built structures, infrastructures, natural elements and reflection of spatial use and functions altogether forming authentic local character and appeal. As such, spatial identity is never a stable construct. Local character or identity (in this terms) of each place is continuously evolving (Kaymaz, 2013) on the long term bases, however, the essence of it might persists due to the more constant factors influencing its appearance. In addition, urban renewal is amongst the strongest processes to influence the spatial identity, or is at least among the most visibly evident.

In that sense, the European Urban Charter in 1992[6] was at European level among the first concerted efforts to bring the existing local and urban identity in line with efforts linking legislative reform with spatial and architectural development. Following this agenda, also other more contemporary planning and strategic documents highlight the need to preserve or reinforce the locally specific character and identities, which refer to newly created or retrofitted places. Also, a number of contemporary policies have responded by integrating the protection of traditional cultural landscape into their objectives and measures (Golobič, Lestan, 2016).

The Slovenian legislation concerning planning and design recognizes the term identity in relation to architecture, landscape and urban environment. Most

3 The uniqueness in these terms does not relate to exceptionality but rather represents the solitary in type or characteristics. It is the quality that makes a place recognisably distinct from other types and also recognisably belonging to particular type by particular sub-elements.

4 Notions of place attachment, "*genius loci*", also sense of place – all relevant to explore the nexus between identity and place and quality of people's relationships with a place – have been extensively researched since the early 1970s in the fields of environmental psychology, urban sociology, geography and landscape architecture. A major contribution to the investigation comes from the seminal works of authors such as Proshansky (1978, 1983), Relph (1976), Tuan (1975), Norberg-Schulz's (1980, 1971), among many others. The theories explore the character of places on the ground of their meanings for people, but with substantial differences in the significance of the physical place in this relationship. Quite paradoxically, the mainstream of the psychological views have neglected the physical built environment as a factor of importance in the identity development, whereas geographers for instance have recognised predominant role of it.

5 Places also represent personal memories, and because places are located in the socio-historical matrix of intergroup relations, they represent social, common memories and interpretation of space (Lappagard, 2007). Lowenthal (1979) has suggested that 'the past' exists as both individual and collective construct, with shared values and experiences being important within cultural groups. Group identity is thus closely linked with the form and history of place, creating an identity of place.

6 In 1992 the Congress of Local and Regional Authorities of the Council of Europe adopted the first European Urban Charter which lays out a series of universal guiding principles and set of methodologies concerning the improvement of the quality of living in European towns and cities with a focus to specific responsibilities relating to different aspects of urban development and good urban management at local level.





Figure 1 & 2: Piran and Lozisca, Brac: The identity of place as an expression of local or regional authenticity in architectural terms. Slovenian planning legislation recognizes the term identity in relation to architecture, landscape and urban environment.

frequently is used in the strategical document of *The Spatial Development Strategy of Slovenia*[7] as an expression of local or regional authenticity in place-based and architectural terms.

Similarly, the UK central government guidance outlines the importance of a wider context of the architectural settings. The document lays attention to a wider portrait of the locality that determines certain architectural settings and thus contributes significantly to the identity and character to it: "*Considerations of design and layout must be informed by the wider context, having regard not just to any immediate neighbouring buildings but the townscape and landscape of the wider locality. The local pattern of streets and spaces, building traditions, materials and ecology should all help to determine the character and identity of a development/…/* (Planning Policy Guidance Note 3: Housing PPG3, 2000, 19).

Returning to the foretold research: the concept of the spatial identity as described is incorporated in the proposed methodology for the assessment of local environments and resources[8] (also rational use of resources brought together into sustainability performance index) in Slovenian neighbourhoods. More specifically, the expressed identity of neighbourhoods indicated through a set of indicators, represent a significant share of the overall score in the proposed assessing methodology.

ASSESSMENTS OF LOCAL ENVIRONMENTS AND ITS RESOURCES

As a leverage to support preservation of spatial identity as a quality and to support prudent decision-making regarding urban renewal at the neighbourhood level, the methods for the assessment of neighbourhoods' resources, management and sustainability performance are searched for. One of the burning research issues in last decades has been the identification of suitable criteria and indicators for the assessment of high-quality living- and energy efficient- residential environment in neighbourhoods, where we can observe large discrepancies

7 Strategija prostorskega razvoja Slovenije, 2004. Ministrstvo za okolje, prostor in energijo, Direktorat za prostor (Ur. list RS 76/2004).

8 The term local resources are used in this paper in its widest sense. They stand for the natural, architectural, cultural and social assets associated with a certain spatial unit (e.g. neighbourhood).

in the sense of the purpose of the different researches/tools and the scopes undergoing impacts assessment.

However, most of the sustainability assessment tools, as often denoted, are designed to ensure that outcomes of plans and activities make an optimal contribution to urban sustainability and create the possibility for comparison (Pope et al., 2004) among the single objects, neighbourhoods or different plans. Alternatively, as Blum and Grant state (2006), in general a good assessment tool transfers data overload into information useful for better decisions.

Sustainability assessment tools usually evaluate and rate the performance of a given neighbourhood against a set of criteria to assess the neighbourhood's position on the way towards approaching sustainability goals (Sharifi, Murayama, 2014). A diversity of schemes/tools exists and they vary considerably in what and how they measure and how the measurement results are presented and interpreted (Karol, 2009). Most of them have a strong focus on environmental issues and the majority are designed for the building scale on the one hand or looking more globally at the urban scale on the other (Bird, 2015). There is of course also a major difference, whether the development concerns new building projects or deals with the existing building stock. New building projects facilitate the employment of the most recent technologies, materials and experience to build, for example, superior energy or access standards. Developments using the existing building stock contribute to the improvements (in terms of energy and emission efficiency), conservation of natural resources (material, land in particular) and cultural heritage and identity (Blum, Grant, 2006), which brings different measures and indicators into the scheme.

In European and Slovenian legislation frames, the methodology for energy impact assessment at the level of individual buildings has already been developed, enacted and implemented[9]. In addition, the International Organization for Standardization (ISO) has been active in defining standardised requirements for the environmental assessment of buildings and on the level of the cities[10]. Currently, no standardized indicators for neighbourhood sustainability assessment had been developed at ISO. The closest is the ISO 37120:2014 at the level of flexible-sized communities *(see footnote 10),* which mostly relates to community aspects of quality living and access to services.

Nevertheless, certain standards have evolved in different countries worldwide to assess sustainability performance also at the neighbourhood level in terms of urban design and planning. Special concern in these regards goes to well-known standards such as CASBEE for Urban Development (Japan), BREEAM Communities (UK), LEED ND (USA), DGNB Urban Districts (Germany), HQE2R (France), SBTool (Canada) among many others. These frameworks are multi-stage rating schemes for urban developers, which, as Sharifi & Murayama (2013) claim, can often be classified as "spin-offs" of building environmental assessment tools. As noted by Karol (2009), there are common themes emerging in these assessment tools such as the need to restore native vegetation, reduce private car use, reduce the use of non-renewable energy in buildings, minimize waste, improve water efficiency, provide high quality public transport and safe access to a broad range of social facilities; however, here is little or no consistency in how to measure progress and set benchmarks for achievement.

Other related research and studies in the European frames can be divided into two groups: first, those in search of suitable metrics and actions in accordance with the guidelines of European energy and sustainability policy in the existing small agglomerations and their parts; and second, implemented pilot cases of sustainable efficient and high-tech constructions in smaller neighbourhoods resulting from previous research and assisting as a research polygons for determining new metrics and actions. In both cases, enormous attention is payed to energy efficiency and emissions reduction in comparison to other rather neglected categories of sustainability.

As noted before – in Slovenian legislation the methodology for energy impact assessment at the level of individual buildings is the only mandatory step implemented. Other attempts in terms of quantitative or descriptive sets of metrics that provide a standardized set of definitions and methodology for – (A) more holistic (not just energy-related) assessment and (B) assessment scaled to the neighbourhood level – have not been implemented in Slovenian legislation nor were applied in terms of the pilot cases.

In the years 2011/12 and 2012/13, two campaigns of the project Energy efficient neighbourhoods in Slovenia were run by the Ministry of Environment and Spatial Planning. The project is interesting from the point of public informing and awareness raising on the benefits and the meaning of efficient energy use. 22 different participating neighbourhoods participated (five groups took part in both campaigns), which represents more than 140 households. The project was more action- than research-oriented; therefore, the potential to transfer the results into further studies is limited. The project dealt mostly with energy efficiency, partially also with emission reduction on the level of households.

9 Energy act and related legislation, e.g. Pravilnik o učinkoviti rabi energije v stavbah PURES-2 2010 stavbah (Ur. l. RS, št. 52/30.6.2010)

10 ISO Technical Committee 59 "Building construction" and its Subcommittee 17 "Sustainability in building construction" have published two technical specifications (ISO/TS 21929-1:2006 and ISO/TS 21931-1:2006) to assure sustainability in building construction; ISO 15392:2008 identifies and establishes general principles for sustainability in building construction, throughout their life cycle - from cradle to grave. However, this standard does not provide benchmarks for the assessment (Andrade et al., 2012); also, indicators for service delivery and quality of life ISO 37120:2014 have been evolved on the level of flexible-sized communities.

Building and Civil Engineering Institute of Slovenia regularly issues publications that relate to sustainable building. These mostly contain the guidelines for building design. The actions and guidelines on the level of neighbourhood are not particularly discussed, nor have they developed the methods for assessing sustainability on larger scales. In the individual studies with a smaller scope of research, we can find a few attempts to determine the parameters of sustainable efficiency on the level of cities (Berdavs, 2010) and neighbourhoods (Mrđa Kovačič, 2012). The second study, in particular, holds great promise to contribute to the set of parameters that are crucial in neighbourhood assessment. The central part of the study covers the meta-analysis of five existing European neighbourhoods i.e. Malmö (neighbourhood Bo01), Linz, (SolarCity Pichling), Hannover (Kronsberg), Stocholm (Hammarby Sjostard) and Helsinki (Vikki). This analytical comparison of popular "eco-cities" provides a useful set of basic directions that could be used on the level of neighbourhoods, however with substantial further structuring and establishing tangible indicators as well as extending it to other relevant scopes (apart from energy and emissions or natural resources).

ENVISIONED ASSESSMENT MODEL

The envisioned model of assessment, which we develop in our research shall evaluate sustainability performance through five crucial categories each set as a cluster of sub-categories and indicators. While energy efficiency and emissions reduction are encompassed in the system, however, we plan to lay more attention to cover other, less often evaluated features, among which the indicators of spatial management, spatial identity and community engagement take place.

Slovene neighbourhood

In geo-spatial terms, the research examines the Slovene neighbourhood as a functional residential unit of basic services/facilities gathered around dwelling activities. Such entity represents a typical cornerstone of urban, sub-urban or rural settlement fabric. Due to past socio-cultural and political-economic situation, Slovenia's settlement system and housing stock have a specific structure (heterogeneity, proprietorial structure, size and distribution of the settlements), which is reflected in the dwelling types and residential infrastructures (Čok, 2014). The variation of density and building types in combination with the variation of population density, climate, morphological and seismic factors, distinct commuting patterns and population aging process in Slovenia (Kerbler, 2015), distinguishing Slovene cultural landscape typicality, which we strive to preserve, do not allow single transfer of foreign practices (whether in terms of retrofitting practice or sustainability assessments methodologies). They require, at least in part, the development of identifiable, unique system of assessing common efficiency and sensible management of local resources that would support their modular, sustainable retrofitting adapted to Slovene natural and cultural environment.

Categories of the assessment

Sustainability performance within our index is planned to be assessed/evaluated through five crucial categories of which three are independent categories and two are corresponding and relate to all the others. The examination covers the categories with particular targeted issues (see also *Table 1*):

(1) energy efficiency (*cooling systems, heating systems, ventilation, building envelope/isolation, orientation of buildings, daylight entry,…),*

(2) environmental efficiency, (*waste/water management*, *greenery maintenance*, *clean energy sources*, *emissions (reduction)*, *soil/ground managing*, *organic waste/biomass/biogas production,…,*

(3) efficient use, management and preservation of the built environment *(use/organisation of space in/around buildings, functionality of dwelling, management of cultural heritage and cultural values, walkability/bikebility,…),*

(4) residents' and communities' engagement level *(habits and attitudes towards household consumption, eco-central perspectives, civil initiatives activity, community decision-making, community awareness,…),*

(5) exploitation of ICT smart solutions (*use of smart thermostats, intelligent lightning, smart watering systems, use of smartphone as sensors, ICT-based road system, apps for car sharing,...)*.

Each of the given categories is to be observed from the aspect of the three strategic levels of implementation:

(1) individual buildings/households;

(2) public spaces, in-between spaces, public infrastructure;

(3) traffic (infrastructure, organization, flows).

Such clustering ensures pragmatic amalgamation of indicators that goes beyond the scale of individual building and its functional properties, rather serves to holistically capture the efficiency and performance of public places, squares, streets, parks, infrastructure, etc. As such, the index enables the comparison between neighbourhoods' settings and support strategic decision making. Due to transparent system of indicators and their relation to existing phenomena and concrete actions, the instrument can assist one to reconstruct the hidden complexity of a certain neighbourhood. This allows for identifying how dynamic and interactive a certain geo-unit is, as well as to understand why this occurs and what contributes to a certain setting and quality.

Table 1: Neighbourhood Sustainability Framework – assessment categories through the three relevant levels of retrofitting. Not all the targeted topics will be adequately addressed; potential other topics will be added if found suitable or essential for the overall index.

Levels of examination/ implementation Assessment categories	**BUILDINGS/HOUSEHOLDS**	**PUBLIC PLACES/ "SPACES BETWEEN"**	**TRANSPORTATION INFRASTRUCTURE/ MOBILITY**
ENERGY EFFICIENCY	Targeted topics: • heating systems • cooling systems • ventilation • building envelope/isolation, • orientation of buildings, • daylight entry • …	Targeted topics: • orientation of places • sun exposure • daylight entry • pavement albedo value • lightning • shading by green • ...	Targeted topics: • mobility demand • modal split shift • public transport use • 1 in car/4 in car • infrastructure lightning • walkability/bikebility • …
ENVIRONMENTAL EFFICIENCY	Targeted topics: • greenery maintenance • waste/water management • clean energy sources • emissions (reduction) • soil/ground managing • organic waste/biomass/ • biogas production • …	Targeted topics: • clean energy sources • waste management • organic waste/biomass/ • biogas production • water management • emissions management • green areas (maintaining) • …	Targeted topics: • use of fossil sources • clean energy sources • mobility demand • distances (reducing demand) • traffic emissions • green buffers • noise buffers • …
SPATIAL/URBAN EFFICIENCY	Targeted topics: • use/organisation of space in/around buildings • dwelling comfort • functionality of dwelling • management of cultural heritage and cultural values • preserving local identity • …	Targeted topics: • organisation of public spaces • ease of use (infrastructure, urban furniture…) • supply and services organization • places appeal and amenities • management of cultural heritage • place identity preservation • …	Targeted topics: • organisation of traffic infrastructure • organisation of traffic flows • accessibility • walkability/bikebility • distances between POIs • infrastructures sharing • …
COMMUNITY ENGAGEMENT (parallel category - relates to all above categories)	Targeted topics: • habits an attitudes towards household consumption • personal motivation for engagement in decision-making • personal believes about the environment • eco-central perspectives …	Targeted topics: • neighbourhood organisation and activity • community decision-making • civil initiatives activity • community attitudes • community awareness • community education/ learning • …	Targeted topics: • traveling habits: _ car(s) ownership _ use of public travel modes _ use of private travel modes _ from door to door demand • road, rail infrastructure and organisation decision-making …
ENGAGEMENT OF SMART TECHNOLOGIES (parallel category - relates to all above categories)	Targeted topics: • use of smart thermostats intelligent lightning, smart watering systems … • digital apps for organising the household supply and demand • smart gadgets • use of smartphone as a sensor • …	Targeted topics: • intelligent lightning, watering, shading… • use of digital sensors and apps for managing the consumption • use of digital sensors and apps for informing about emissions • apps for decision-making or informing …	Targeted topics: • ICT-based road systems • ICT-based transport logistics • public transport ICT-solutions • ICT-based traffic info • apps for car sharing • apps for city bike rent • real-time route planers • ...

Modularity and flexibility of the system

Two of the most important objectives ensuring the pragmatic potential of the instrument are modularity and flexibility of the system of indicators in a manner that allows for assessment and comparison of various neighbourhood types with locally specific features and at the same time preserves a sufficient degree of universality allowing comparison, repetition and control. Secondly, the modularity in assessment enables the modularity in actions, which provides the opportunity for gradual retrofitting and improvement in sustainability of neighbourhoods, starting with most urgent, economically necessary or feasible actions. Third, individual indicators and related categories are prudently connected in such a manner that allow for reaching partial results even if a certain item of information is not available or is irrelevant in a given neighbourhood. The level of "resolution" and "fineness", as well as the level of reliability increase with multiplication of input data from two or more sources, where this is possible. In the case, one source falls behind or is non-existent; another one is used to make the assessment. In the case of unavailability of data in particular segments or lack of time and means, the index can be used partially (elimination of certain sub-segments).

Methodologies and approach

To establish the described assessment model two main research pillars are addressed: 1) the development of the structured and modular system of indicators; and 2) the development of the methodology to interpret the resulting values (efficiency, ability and productivity on different levels of human activity). The methods applied are modularly arranged and go for theoretical, numerical and empirical. In the initial phases, we conduct a meta-analysis of the existing, more or less established parameters that affect distinct segments of the neighbourhood efficiency. The theoretical part also revises the interrelations of selected elements/phenomena of built environments and their impact on the selected segments of sustainability performance. Following the research timeline, each spatial level (*see Table 1*) of examination represents a distinct research module. The parameters extracted within each module will be gradually embedded in the final structure of the instrument. Using a robust multi-criteria and compensatory decision-making method (such as *AHP - analytic hierarchy process; parameters pairwise comparison)* we will simplify the decision-making procedures by selecting the suitable parameters and defining their weights in the model. The combination of mathematically numerical methods shall be applied in the further process of establishing the new model for interpreting the data and weighting their significance for partial and final values of the index. Based on the analysis carried out and algorithmic modelling, the hierarchy and modularity of the system shall be attained, where qualitative and quantitative datasets are combined and then appropriately numerically revalued.

Empirical part of the research

After the initial phases of this research project, six Slovene pilot neighbourhoods will be selected and applied to assist as a "research testing ground". Empirical examination within these study cases follows a list of objectives, i.e.: (a) the validation of theoretical knowledge, (b) the identification of differences in respect to local specifics of the selected neighbourhoods and consequently identification of reservations regarding the application of the existing evaluation methods, (c) the examination of theoretically less supported correlations and impacts among individual features of neighbourhoods (built structure, natural conditions, economic sustainability, population demographics, habits, etc.) and their sustainable efficiency (according to set categories), (d) the examination of indicators' accessibility, reliability, datasets frequency, geographic data resolution, etc. Our experience shall be used efficiently to design and overview indicators system, which will be able to resolve data deficits also with its modularity, (e) testing the individual segments of neighbourhoods efficiency, (f) the examination of neighbourhoods' community and its potential with regard to crowdsourcing (the use of smart phones, cooperation through sourcing and forwarding the data and indicators appropriate for this kind of sourcing).

The selection of pilot neighbourhoods shall follow four key selection criteria[11] ensuring heterogeneity of sample neighbourhoods and thus allowing for a greater universality of the final instrument for the Slovene territory.

Data gathering

Majority of the indicators for the assessments shall be calculated, gained or extracted (e.g. using GIS) from

11 Criteria: 1) level of urbanization of the neighbourhood according to its urban/rural origin (urban, suburban, semi-urban, semi-rural) – this is an important factor of choice as regards the morphologies, densities, communal waste water and public services equipment, centrality and traffic flows (gravitation), also demographic structure; 2) age (oldness) of the neighbourhood or the level of retrofit of the neighbourhood as a whole – age/renovation of a significant part of the building stock and infrastructure – this is crucial factor of choice as regards the existing sustainability efficiency due to various building and planning standards/norms in the time of their design, construction or renewal; 3) type of building stock and housing typology (single family or multifamily housing, common public spaces etc. – this is an important factor as regards ownership structure and management (collective, individual), and the share of open space under the public management; 4) declarative (promoted) sustainability or energy efficiency of the neighbourhood – this is relevant solely for those neighbourhoods with any of the segments of efficiency particularly declared/promoted.

the existing official databases (GURS-REN, EUROSTAT, SURS, ZK KS, GJI, ARSO)[12], as well as from the energy source's distributers and local operators of public infrastructure.

Foreseeing the lack of available data and reliable indicators at the neighbourhood level, the research contemplates special examination (transversal objective) of their availability, accessibility, adequacy and usefulness of the existing indicators, and the possibility of unleashing the potential of smart services and networks for sourcing micro-spatial data. Modern technology at disposal (GPS technology, geo-located services, geo-referential data, e- and m- services, etc.) provides various possibilities for mass crowdsourcing (»collective sensing« concept, see Resch, 2013, 391-406), which can represent a valuable source of time-specific and locally-specific data and details, comprising various aspects of our everyday, our habits, views, observations, attitudes and preferences. Thus, other sources shall include crowdsourcing via smart phones, data gathered through surveys and research among stakeholders; data gained through expert evaluation, qualitative evaluation and data extended with field measurements (when there is no other option available).

POTENTIALS

The objectives of this research project coincide with the efforts of many other research groups and projects in European or worldwide frames. The common strive for more sustainable living environments expands from household management, single house planning to neighbourhood and city levels. However, along with the differences in scale levels by which a certain sustainability performance indexes are defined, there are vast differences in the aspects of sustainability to be addressed. In this regards we conceived of a framework relevant for Slovenian neighbourhoods and fitting to Slovenian planning and environmental policy, by which the common retrofitting strategy can be developed and by which more suitable decisions according gradual renewal can be attained.

Although currently this research bears its initial stages, there are several aspects that can be exposed as regards the foreseen results and potentials. In relation to the existing cases of similar practices in Slovenia, the contemplated approach strongly emphasizes the more holistic, far from solely energy-driven assortment of metrics and measures. Architectural development, functional arrangements, conservation of the place identity and community engagement among others play an important role here. The development of metrics system is therefore being gradually built on the basis of the tangible spatial elements (as the factors of impact), which can most easily be connected with positive or negative effects on the quality of dwelling at all levels, from household and own house, to public space and infrastructures. Progressively other key factors shall be incorporated in the system originating from broader time- and spatial- context, if proved to be of significant importance to the final values of the index. The potential of such structuring corresponds to geographic concept of mutual interrelation among spatial features and mutual influencing among phenomena, even if rooted outside the investigated neighbourhood.

Second, combination of quantitative and qualitative approach to definition and evaluation of neighbourhood identities will be demonstrated. Quantified form shall be supported by a strong qualitative meaning of separately included sub-indicators. An index designed in this manner does not answer only the question of *how much*, but also *why that much*, placing the instrument on the intersection of informative, educational, or instructional realm. By addressing traceable and tangible spatial phenomena and elements and their cause-effect connection to everyday experience of dwelling on the level of neighbourhood, building, and public space, the abstract notion of sustainability becomes concrete and tangible. The structured nature of sustainability performance index allows it to be used as an educational or demonstrational tool. Especially by integrating the developed method of assessment with innovative applications (ICT-driven) or extending it in terms of visual representations, the results are widely accessible and provoke public spatial literacy, as well as encourage direct engagement with the inhabitants or the community to better understand their interests, concerns and priorities in their neighbourhoods. With this we are addressing one of the main objectives of our previous work (*blinded ref.*) – the development of methods and tools that support participatory urban design and the transfer of spatial information in user-friendly and visually supported form.

As stressed initially, concurrently to central objectives (dedicated to establishing an assessment instrument) we shall also be studying the availability/accessibility of data, and the potential of the instrument to take advantage of contemporary pervasive technologies both, in terms of data capture, data reuse and data/information representation. Especially data reuse is a strong goal of this research. Existing relevant indexes and indicators are examined in terms of the possibilities to connect them and integrate them within the assessment model. Fine-grained urban sensing coupled with well-established remote sensing mechanisms (Resch, 2013;

12 GURS-REN – the Surveying and Mapping Authority of the Republic of Slovenia - Register of real-estate property, SURS –Statistical Office of the Republic of Slovenia with the data from the fields of population, labour market, education, transport, environment, etc.; EUROSTAT; ZK – Land Registry, KS – building register; GJI – Economic Public Infrastructure Register; ARSO – Slovenian Environment Agency – climate and other environmental data; GIS – local and individual bases of geographic information systems.

Resch et al., 2015) and gross data (official statistics datasets, records) greatly enhances our potentials in terms of increased geographical resolution of captured data, denser timescale and finer eloquence. Consequently, the instrument makes it easier and more cost effective to identify segments of high and low sustainability performances within the neighbourhoods, as to differentiate and manage them, understand their dynamics, and thus, guide urban diagnostics, responsive interventions and policies as well as prioritize smart investments

CONCLUSION

Rerecord-keeping and monitoring the evolution of neighbourhoods throughout their identities and from the broad concept of sustainable development, as well as short- and long-term benchmarking/comparability of retrofitting implementations are some of the primarily targeted goals of our research and envisioned instrument. The methodology for energy impact assessment at the level of individual buildings has already been implemented; also, attempts to provide standardized sets of definitions and measurements in terms of more holistic and complex multi-criteria systems have been developed to reach improved building sustainability. However, as many other authors claim, most of the past studies on sustainability assessment have focused on either the city level or building level whereas the assessment of neighbourhood sustainability, an intermediate level, has received little attention in general (Yigitcanlar *et al.*, 2015), especially in terms of modular retrofitting. Second, the complex concept of sustainability and the coverage of different themes by different assessment instruments make it difficult to transfer the existent models of assessment in locally specific environments or to adapt it to specific goals of evaluation.

The envisioned instrument reaches out for the evaluation methodology that extends to the scale of neighbourhood as of vital residential, economic and functional significance. At the same time, it examines geo-entities analytically, in relation to its individual parts and features; it transparently identifies leverages that impact rational use of local sources which further affect environmental capacities, economic vitality, spatial identity or the quality of dwelling. In this regards such databased approach represents the basis for high-tech and ICT-based measures, i.e. smart cities principles, as well as for low-tech solutions such as the use of algae technologies for the needs of water treatment or biomass production. We are aware that such spectrum calls for knowledge and research methods from a wider range of disciplines, which can – bonded together – support higher responsiveness of urban planning. For this reason, this research project involves extensive support of experts with adequate scientific and technical capacity, expertise and skills necessary to accomplish such interdisciplinary task.

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PREPOZNAVANJE IN OHRANJANJE LOKALNE IDENTITETE PROSTORA SKOZI MODEL PRESOJE TRAJNOSTI V SOSESKAH

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POVZETEK

V članku obravnavamo problematiko prostorske identitete in njen pomen pri uspešni prenovi lokalnega urbanega okolja oziroma sosesk. Posebej se osredotočimo na problem presoje trajnosti v soseskah in izbor kazalcev, ki jo določajo. Pri tem je identiteta prostora (kot izraz lastne prepoznavnosti) pomembna kvaliteta grajenega okolja, njena ohranjenost pa pomenljiv kazalec pri presoji trajnosti. Reševanje te problematike na sistematičen in metodološko dorečen način narekuje zanesljive metrike oziroma kazalce za vrednotenje lastnosti urbanega okolja. Obenem daje konsistentno in jasno definirane ciljne kvalitete, ki lahko opredmetijo cilje trajnostnih politik in so obenem ključni nosilci pomena, tako za prebivalce kot načrtovalce in izvajalce smotrne prenove sosesk. V članku prestavimo zasnovo tekoče raziskave, ki obravnava dani problem. Natančneje, znotraj raziskave razvijamo model vrednotenja trajnostne učinkovitosti na osnovi modularnega sistema kazalcev in povezane metode interpretacije vrednosti. Gre za zasnovo instrumenta, ki na osnovi merljivih kvantitativnih in kvalitativnih kazalcev presoja trajnostno učinkovitost sosesk skozi pet temeljnih kategorij, in sicer z vidika: (1) energijske učinkovitosti, (2) okoljske učinkovitosti, (3) racionalne rabe in ureditve grajenega prostora, (4) stopnje aktivnosti prebivalcev in (5) stopnje uporabe pametnih tehnologij/rešitev. Vsaka od danih kategorij je motrena skozi optiko treh strateških ravni, in sicer: (a) stavbe oziroma gospodinjstva, (b) javnega/vmesnega prostora (c) organizacije prometa in infrastrukture. Takšen okvir prinaša možnosti za vrednotenje sosesk tako v smislu naravnih in grajenih lastnosti, videza in funkcionalnosti, kot tudi aktivnosti, navad in demografsko-socialne strukture prebivalcev. Skozi te elemente in pojave je mogoče kvalitete prostora prenesti v merljivo obliko, ne zgolj v raziskovalne namene, ali kot podporo odločanju v prostorskih intervencijah, pač pa tudi kot sredstvo izobraževanja o prostorskih danostih ter spodbujanja odgovornega odnosa do njegovih zmogljivosti.

Ključne besede: prostorska identiteta, urbano oblikovanje, trajnost, vrednotenje, soseska

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SPATIAL, URBAN AND ARCHITECTURAL FEATURES OF THE CENTRAL ISTRIA - RESEARCH IN THE AREA OF THE HISTORIC PAZIN COUNTY

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ABSTRACT

The study analyses factors of identity of medieval Istrian settlements in central and north-eastern Istria, or areas of historical Pazin County. Spatial, urban and architectural settlement features are analysed by observing the structure, shape and appearance of the settlement, its streets, squares and urban development. The research aims to use the perceived urban and architectural features and other types of research results to evaluate the current state of architectural heritage and the environment in the investigated area in order to improve their condition.

Keywords: central Istria, Pazin County, urban history, settlement identity

CARATTERISTICHE URBANE, ARCHITETTONICHE E PAESAGGISTICHE DEGLI INSEDIAMENTI DELL'ISTRIA CENTRALE – ANALISI SPAZIALE DEL TERRITORIO DELLA STORICA CONTEA DI PISINO

SINTESI

La ricerca analizza i fattori d'identità dei borghi medievali nell'area centrale e nord-orientale della penisola istriana, cioè nel territorio della storica Contea di Pisino. Le caratteristiche architettoniche, urbane e paesaggistiche di questi insediamenti vengono studiate attraverso un'analisi approfondita del loro sviluppo urbano e della loro struttura e organizzazione spaziale (la forma e il tessuto urbano, le strade, le piazze). A partire dal riconoscimento delle caratteristiche architettoniche e dello spazio urbano, scopo della ricerca è valutare le attuali condizioni del patrimonio architettonico e paesaggistico, con il fine ultimo di poterlo così promuovere e valorizzare

Parole chiave: Istria centrale, Contea di Pisino, storia urbana, fattori d'identità spaziale

INTRODUCTION

Subject of the research

Urban and architectural forms of medieval settlements in Istria were created by mixing characteristics of two different cultural traditions or two different cultural circles (Central European and Venetian). Settlements in central Istria, in historic Pazin County, still retain their medieval character and scope.[1]

This paper is part of the research that looks at the development of Istrian settlements in an area of similar geographical and architectural features. In this case study, using the example of settlements of Pazin County, factors of identity of medieval Istrian settlements are analysed.[2] The study considers the area of central and north-eastern Istria, in the historical context of the area of Pazin County.[3]

Previous research

Development of settlements in Istria was analysed in a number of master's theses as well as within a research project of the Institute of Art History in Zagreb and conservation studies used l retainedral features,for drafting spatial plans. For example, Maja Štrk-Snoj wrote about the development of Boljun in a series of articles in *Lupoglavski zbornik* (Štrk-Snoj,1982; Štrk-Snoj, 2001, 101-129; Štrk-Snoj, 2003, 147-159). These articles were based on her master's thesis. In the scope of the research project ""scope of the research project „Border fortresses and cities in north-eastern Istria (former Rašpor captaincy)", the Institute of Art History dealt with the historical development and problems of revitalization of these settlements (***Buzet, 1983). [4] The conservation study for the town of Pazin in 1994 by Boris Vučić and Attilije Krizmanić adopted the methodology of pted thethe Institute of Art History (applied in the already mentioned research project) and addedned research project) and adds information about the preservation of buildings and desirable construction interventions. A similar methodology was applied in the master's thesis of Jadranka Drempetić (Krizmanić, Vučić, 1997; Drempetić, 1997.).

It should be noted that Marijan Bradanović, in addition to analysing settlements and evaluating castles in the regional framework, deals in his articles with the analysis of archival sources and collections which he used in his research. His research is important for documenting the conservation interventions on historic buildings, the methods used and the reasons for undertaking these interventions (Bradanović, 2004; Bradanović, 2006, 183-193; Bradanović, 2007; Bradanović, 2009a, 1-20; Bradanović, 2009b; Bradanović, 2009c; Bradanović, 2010; Bradanović, 2013).

The majority of the researched settlements are mentioned in a number of articles addressing the development of wall paintings and sacral architecture. A valuable source of information for determining the time of construction of buildings and certain historical events are copies of the graffiti made by Academician Branko Fučić.

Sources used in the research

Archival sources are primarily related to cadastral maps from the 19th century in the scale of 1: 2280, the cadastral survey of Francis I of 1820 and the cadastral survey of 1874.[5]

Cartographic sources refer to the detailed topographic map (DTK25) in scale 1: 25000, Croatian Base Map (HOK) at the scale of 1: 5000, digital orthophoto maps (DOF) in the scale of 1: 5000 and a cadastral map at a scale of 1: 2000.[6]

Method of research

Spatial, urban and architectural features of settlements are analyzed by observing the housing and urban structure, shape and appearance of a settlement, its streets, squares and urban development. The analysis included thirty-two medieval settlements in Pazin County. The survey was conducted by field visits and by examining historical and contemporary survey maps.

1 Throughout different historical periods the Istrian peninsula was under the influence of two strong cultural traditions. The western part of Istria and coastal towns were under the influence of the Venetian cultural circle, while central and eastern Istria was more strongly influenced by the Central European cultural circle owing to their feudal owners.

2 This research is part of the scientific project *Heritage Urbanism (HERU) - Urban and Spatial Models for Revival and Enhancement of Cultural Heritage* financially supported by the Croatian Science Foundation (HRZZ-2032), which is being carried out at the Faculty of Architecture University of Zagreb, under the project leadership of Prof. Mladen Obad Šćitaroci, Ph.D., F.C.A.

3 North-eastern Istria, the Pazin area, is the geographical and historical name of the central part of Istria around the river Pazinčica and its abyss, with the centre in Pazin. In the historical context, Pazin area almost completely overlaps with a section of Pazin County borders from the 14th to the 18th century, except for the areas of Motovun and Karojba.

4 Buzet was researched from 1981 to 1983. The aim of the project was to determine its historical development and current condition, and to provide guidelines for the use of architectural heritage of such historic centres.

5 The first extensive survey on the Istrian soil was conducted in 1785 as part of Joseph II Land Survey of the Habsburg Monarchy. The first systematic survey of Istria was carried out as part of the cadastral survey of the Habsburg Monarchy from 1817 to 1822. That survey produced first cadastral maps at a scale of 1: 1440 and 1: 2880 for the whole area and the corresponding cadastral studies.

6 The use of all cadastral contributions was granted by the State Geodetic Administration and the Regional Cadastral Office Pazin (www.dgu.hr).

Numerous data were collected by overlapping cartographic documents and literature available from archival sources (historical data from *urbar* and other historical documents such as correspondence between fifes and rulers, in which modernization of the castle was often demanded). By overlapping cadastral maps from 1820 with the modern cadastre, reliable recognition of the construction after 1820 was enabled, and thus also a clearer insight into the historical matrix of settlements.

Within the boundaries of the historical core[7] of each settlement field research of smaller urban units (blocks, streets, squares) was carried out with an inventory of all historic buildings recorded in the cadastre of the early 19th century, available earlier graphics and plans (especially Valvasor graphics) (Lipovac, 1994; Tosco, 2003, 133; Valvasor, 1689). [8]

Buildings important for the development of settlements were also analysed. Determining an approximate or exact year of construction of these buildings was applied in the analysis of the development of settlements while the comparison of stylistic features assisted in determining the time of construction of other buildings in the settlement.

After an analysis of archival and historical documentation, architectural drawings of the current condition[9] were checked for evidence of historical structures and their subsequent development using the archaeological method of stratigraphic analysis.[10]

For each settlement the research analyzed its topographic and traffic position, urban structures and buildings.

The application of the methodology of research, including the archaeological method of stratigraphic analysis, enabled more detailed information on the development of buildings in a settlement, and thus a clearer insight into the urban development of the whole settlement.

The aim of the research

The research aims to use the perceived urban and architectural features, identified types and other research results to evaluate the current condition of architectural heritage and its landscape in the observed scope of the research and possible guidelines for the protection, conservation and sustainable development of the cultural heritage, by finding a way of directing modern transformation of space in these settlements, respecting architectural, artistic and intangible heritage. Although most of the material refers to the late Middle Ages, the research encompassed the period between the 10th and 18th century.

PAZIN COUNTY – PHYSICAL AND HISTORICAL CHARACTERISTICS

The decisive factors for the intensive colonization of Istria were its natural conditions, geological background and climate. Significant changes in the development of towns and town construction in Europe, including our region, occurred at the time of the final collapse of the Western Roman Empire, during great migrations. After the fall of the Roman Empire, the Lombard state and the advent of peace between the Byzantine Empire and the Frankish state in 810, Istria officially became part of the Frankish state. As part of the Frankish state a special Margraviate of Istria was formed in 1040. Feudal relations penetrated Istria with the arrival of Frankish rule in the 8th century.

With the gradual decay of the Margraviate and the creation of Venetian and Hapsburg holdings in Istria from 1251 to 1420, for the centuries to come Istria was divided into two parts, and coastal towns separated from their hinterlands. The border between the Venetian and Habsburg Istria was also the border between two economic systems. Colonate dominated in the Venetian part. Pazin County, a Habsburg holding, was closer to the classic feudal system with serfs as land cultivators, tenants, and a land lord as the main organizer and public authority holder. Serfs' obligations were established in *urbars*.

In 1508 the War of the League of Cambrai against Venice began. Counter-attacking the Austrian Istria, Venice occupied its larger part and destroyed many settlements. From the 16th to the 18th century conflicts over undivided land plots along the Venetian-Austrian border were frequent, causing further destruction as well as further fortification of castles.

Pazin County was the area under the management authority of the captain of Pazin (count) which was

7 The Law on the Protection and Preservation of Cultural Goods (OG 69/99, OG 151/03, OG 157/03, Correction, NN 87/09, NN 88/10). The term "historic core" is a settlement or part of the settlement, which has historically recognizable structures that testify to the human presence in space.

8 Field work on the inventory of buildings was conducted during the research for a doctoral thesis during 2013-2014. It included Barban, Beram, Boljun, Brseč, Draguć, Grdoselo, Gračišće, Gologorica, Gradinje, Kašćerga, Lupoglav, Letaj, Kršan, Lindar, Rakalj, Vranja, Paz, Pazin, Pićan, Momjan, Žminj, Posert, Račice, Sovinjak, Šumber, Tinjan, Završje, Trviž and Vrh.

9 Architectural drawings of the current condition in Pazin County were mainly carried out within the Faculty of Architecture, University of Zagreb, under the leadership of Professor Vladimir Bedenko from 1979 to 2000.

10 The application of the archaeological method of stratigraphic analysis consists of applying stratigraphic analysis on walls of a building and stacking observed stratigraphic units. The goal is to determine changes in the structure of walls and putting them in chronological order. From the first half of the 1980s the possibility of applying this method to the study of surviving architectural parts of the building has been observed. Soon after, the 1990s method was named *Archeologia dell'architettura* and is increasingly applied in the analysis of historical buildings (see: Broglio, 1988, 1996, 1997; Broglio, Gelichi, 1996).



Fig. 1: The position of Pazin County in Istria in the 15th century, author: I. Huic.

registered in his cadastral register - *urbar*. The political concept covers the entire territory of the Austrian Istria (Istrian County), a group of "hereditary countries", small fifes and possessions.

After the War of Uskoks, Habsburgs' intention was to sell the Pazin holding to settle debts. During the 16th and 17th century it passed from one tenant to another. The County changed owners. Pazin County ceased to exist with the collapse of the Venetian Republic in 1797, when the whole region came under Austrian rule.[11]

The church division of the County did not overlap with the political one. The territory of Pazin County was divided between four dioceses: Pula, Trieste, Pićan and Porec.

The geographical position of the interior of Istria and the Pazin County did not have high traffic importance in the Middle Ages. All larger Istrian towns can be found at the coast, along *Via Flavia* that connected Aquileia via Trieste and Poreč to Pula, and continue to *Nesactium,* Plomin, Labin and Kastav. The main roads passed north of the peninsula, and because of the mountains Učka and Ćićarija on the northern and eastern side, traffic was mainly concentrated on the west side (Trieste, Kranjska) and the seaways[12] (Fig. 1).

Settlements and castles in Pazin County were located along traffic routes that branched off from main roads to local roads in the interior of Istria, at strategic points for their defence.[13]

In most central Istrian settlements the historical core is protected as a cultural monument, with individually protected buildings within settlements. The investigated settlements are faced with an increasing depopulation. The main challenge regarding the reconstruction of historical centres that local authorities are now facing is a balance between the development of traditional forms and functions and the preservation of the unique identity of their settlements. Spatial plans do not address the development of settlements respecting their unique characteristics. The only settlements that were developed on the model of entrepreneurial development are the ones in the so-called central development area which comprises the urban agglomeration of Pazin and a larger part of the county of Rovinj, Kanfanar and Sv. Petar u Šumi (*** Istarska županija, 2002; ***Master, 2003; Huić, Šćitaroci, 2015b).

FACTORS OF IDENTITY OF PAZIN COUNTY

Case study selection

Settlements were selected after a review of archival and historical sources, the oldest existing Pazin County *urbar* from 1498 and Pietro Coppo's map from 1525.[14] The analysis included thirty-two medieval settlements in Pazin County.

Three main criteria used in the selection of settlements were:

- physical existence of a castle or parts of fortifications in the settlement,
- preserved medieval fabric and

11 In Croatian historiography, the name Pazin Shire was used first (a direct translation of the Italian and German term), and the term Pazin County was accepted later on, as recorded in *Istarski razvod*.
Istarski razvod is a Croatian Glagolitic monument which describes and regulates the boundaries between individual Istrian municipalities, their feudal owners and the Venetian Republic.

12 Security of maritime communications in northern Adriatic, between northern Italy, southern Adriatic, Dalmatia, Greece and further east was important in antiquity.

13 Posert and his counterparts Gradinje, Paz and Letaj guarded the passage toward Pazin. Vranja, Kožljak, Čepić, Kršan and Boljun are located along the eastern extension of the Via Flavia and monitored Rasa valley. Gračišće, Tinjan, Lindar and Pićan protected the approach to Pazin from the west.

14 The map of Istria, by cartographer Pietro Coppa from 1525, prepared for printing in the Theatrum Orbis Terrarum Abraham Ortelius, Antwerp, 1573.

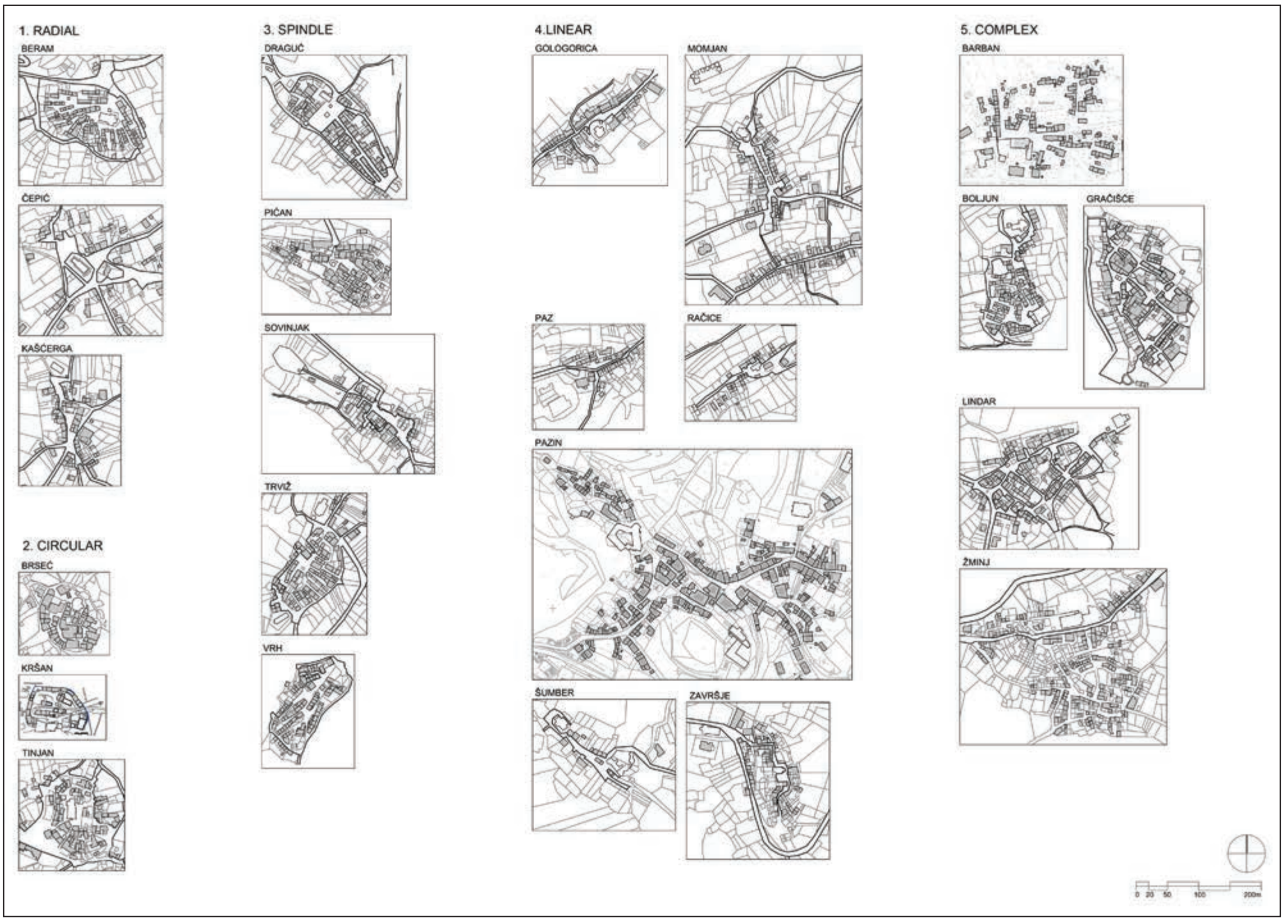


Fig. 2: The layout of settlements, author: I. Huic.

- historical importance of the settlement in the region (see note 9).

In the context of research of urban features, the object of the study are other settlements in the wider region that have a similar historical situation and can provide insight into the historical context of changes in Istrian settlements and castles, but also contribute to their evaluation.[15]

Defining factors of identity

The emergence of unique characteristics of medieval settlements is conditioned by the scale of the town and the medieval way of life that involved intimate relations in everyday life more so than it does today. A medieval town was supposed to meet three primary purposes, which also constitute its initial attributes: traffic and trade (determined by the topographic position and the structure of a settlement), culture (dominant spaces and buildings) and political (defensive framework, dominant spaces and buildings).

Factors of identity to be considered are:

- topographic position of settlements
- the layout and the silhouette of settlements
- the core of medieval settlements
- tissue of settlements
- features of urban elements of the settlement (dominant spaces and buildings) in the historic core of the settlement – town square, public buildings
- defensive framework of the settlement.

Identifying unique features of a settlement will allow for the planning of new interventions in the urban part of the settlement, preserving the fundamental identity of the historical centre of each settlement, but also the cultural landscape of central Istria in general.

Topographic position of settlements

The location of settlements and castles in the landscape of the Istrian peninsula is directly linked to their strategic and traffic importance on the border between

15 Researched settlements are: Gorica, Štanjel, Prem, Socerb, Conegliano, Vittorio Veneto (Seravalle and Ceneda), Portobuffole and Portogruaro.



Fig. 3: The silhouette of settlements (Barban, Draguć, Račice, Završje, Gračišće, Sovinjak), photo: I. Huic.

Pazin County and the Venetian part of Istria. The study of 32 settlements has observed the following types of location:

1. location on a hill or the knoll of a hill – 7 settlements (21.8%) (Beram, Brseč, Grdoselo, Momjan, Završje, Pićan, Boljun)
2. location on a ridge or saddle – 14 settlements (43.75%) (Draguć, Gologorica, Gradinje, Kašćerga, Letaj, Paz, Pazin, Posert, Račice, Sovinjak, Šumber, Tinjan, Trviž, Vrh)
3. location a plateau, in a valley or at the foot of a slope – 9 settlements (28.1%) (Barban, Gračišće, Kršan, Lindar, Rakalj, Vranja, Žminj, Čepić, Belaj)
4. location on a slope – 2 settlements (6.25%) (Lupoglav, Kožljak)

The location of castles and settlements on a hill or a knoll of a hill rising above the surrounding terrain was used for seven settlements. Two castles were built on the slopes of Ćićarija: Kožljak and Lupoglav. The castle or the country house Belaj was built at the foot of the slopes of the Posert castle. In the Čepić field in the valley, there was only one settlement, Čepić.

The layout and the silhouette of settlements (Fig. 2)

The layout of settlements, explored during field visits and by examining historical and contemporary survey maps, largely depends on the topographic location, historical circumstances and its urban development. The analysis of the layout considered the organization of space in the settlement through certain periods and its characteristics.

The analysis of settlements in Pazin County showed that the layout depends primarily on topographic accommodation. Settlements can be divided into:

1. radial layout – 3 settlements (13.04%)
2. circular layout – 3 settlements (13.04%)
3. spindle layout – 5 settlements (21.74%)
4. linear layout – 7 settlements (30.44%)
5. complex layout – 5 settlements (2.74%)

Settlements of circular and radial layout are usually located on the knoll of a hill. In addition, these settlements were, most of the time, hill forts and owe their shape to the shape of the prehistoric settlement. Typical examples of circular and radial settlements are Brseč and Beram.[16] The largest number of analysed settlements (13) has a spindle or linear shape. The layout of the settlement follows the topographic shape of the crest of a ridge, a hill or a pass, stringing buildings parallel to the terrain. Linear settlements follow ridges in one line, while spindle settlements are larger and have several parallel streets that follow the contours of the terrain.[17]

Linear settlements like Pazin, Momjan or Gologorica, regardless of their size, have only one street/communication with a string of houses that follows the ridge and forms a settlement.

Settlements with a complex layout are located on a plateau or in a valley. These are all larger settlements with more than one interconnected but smaller cores.

16 Brseč, a village of circular shape, has a concentric street that climbs to the highest point of the settlement. Village side walls are also walls of houses built into the walls. Beram has a radial grid of streets laid out perpendicular to contour lines of the hill whose centre is the highest point of the village, with a church and a guard tower. In Žminj, the medieval castle was built on prehistoric ruins. The settlement developed around the castle, following the street network perpendicular to contour lines, radially distributed with the castle in the centre and along the communication that passes transversely between the castle and part of the settlement with a radial street network.

17 Pićan is situated on top of a hill and spindle-shaped. The shape of the village forms a series of streets parallel to the terrain. In Trviž and Sovinjak, also spindle-shaped settlements, row houses which form the settlement do not run parallel to the terrain, but are placed perpendicular to the main communication that runs along the ridge on which the village is located.



Fig. 4: The core of medieval settlements – settlements with a castle, author: I. Huic.

Regardless of the settlement shape, in Pazin County, as in the rest of Istria, settlement silhouettes are dominated by vertical bell towers located in the centre of the village (Fig. 3).

In the 19th century settlement silhouettes changed greatly due to the demolition of a part of fortifications, so the analysis of the silhouette is possible from the Valvasor's prints and sketches. Considering the historical silhouette of the settlement, there are:

1. settlements with a castle or/and a guard tower
2. settlements without a castle.

In settlements with a castle and/or a guard tower, the competitor to the vertical of the bell tower is the vertical of the guard tower, and the centre of the settlement has a castle that dominates the settlement.

In settlements without castles, the silhouette is still dominated by a bell tower as a vertical that rises from the compact mass of defensive walls and towers. In the Middle Ages, the today's silhouette with small residential and commercial buildings around a central vertical was hidden by the settlement's defensive walls.[18]

The core of medieval settlements

After the analyses of topographic positions and forms of settlements, analysis focused on the position of the core in the settlement and what was the core around which the settlement was organized.

In the researched settlements of Pazin County which have a castle, the castle is the core of the settlement. The settlement developed according to the position of the castle in the settlement. The area of social life, the town square, is oriented toward the castle and has formed in relation to the castle.

The analysis of settlements of Pazin County shows that following types of settlements with respect to the position of the castle:

1. settlements with a castle – 13 settlements (40.46%) (Kršan, Sovinjak, Završje, Žminj, Dragué, Pazin, Barban, Čepić, Lindar, Momjan, Paz, Račice, Šumber)
   - fortified settlements – 4 settlements
   - unfortified settlements – 7 settlements

18 In Pazin, the main defence tower of the castle was higher than the Romanesque bell tower of the church of St. Nicholas and dominates with the large mass of the castle in the silhouette of the town. In Barban, the main tower was also higher than the Romanesque bell tower of the parish church, dominating in the silhouette of the village.
In Valvasor's graphics of Beram and Trviž, the silhouette of the village is dominated by the defensive tower in its centre. The silhouette of Kršana is still dominated by the defensive tower as the tallest structure in the village until the construction of the bell tower at the end of the 19th century.

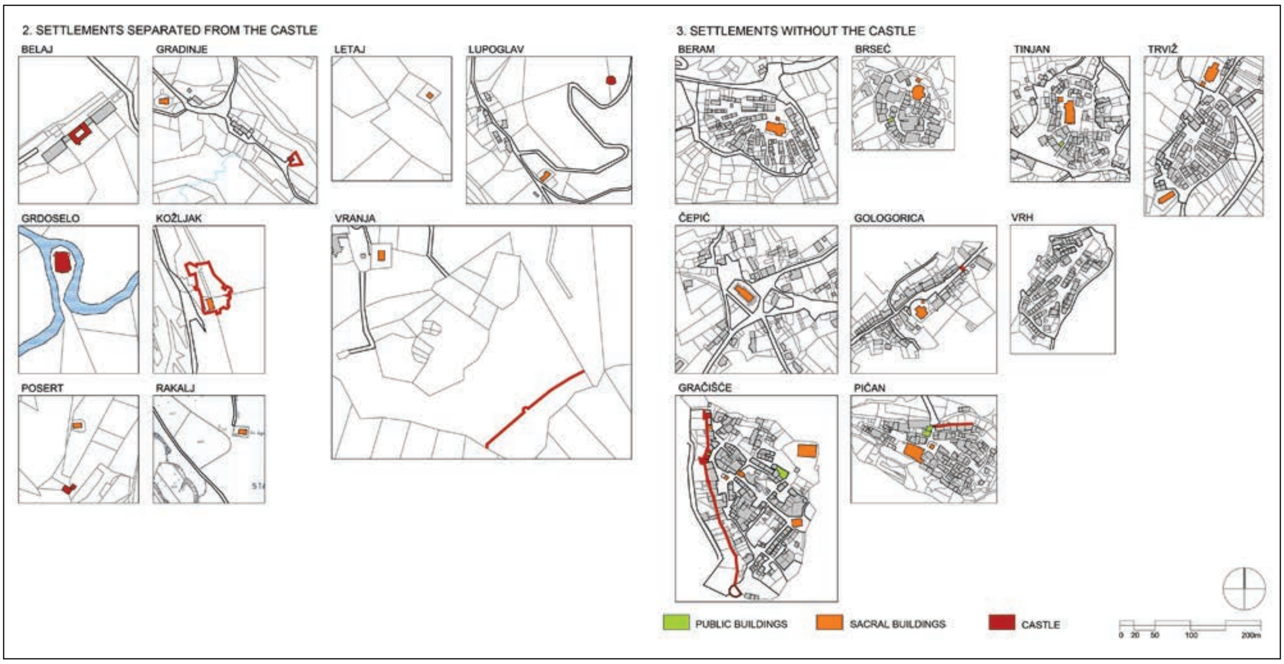


Fig. 5: The core of medieval settlements – settlements without a castle, author: I. Huic.

- fortified settlements with a castle and an unfortified suburb – 2 settlements

2. settlements separated from a castle – 9 settlements (28.12%) (Belaj, Gradinje, Grdoselo, Kožljak, Letaj, Lupoglav, Posert, Rakalj, Vranja)
3. settlements without a castle – 8 settlements (25%) (Beram, Brseč, Gologorica, Gračišće, Pićan, Tinjan, Trviž, Vrh)

A castle and/or a defensive building within a settlement have been preserved in ten settlements (Barban, Boljun, Draguć, Kršan, Lindar, Pazin, Račice, Šumber, Završje and Žminj). In three settlements (Beram, Čepić and Trviž) the defensive structure was torn down in the meantime. For six settlements there is no data about a castle in the settlement (Brseč, Pazin, Gologorica, Pićan, Tinjan and Vrh). In another three settlements the castle is separated from the settlement at an easily defensible position (Paz, Momjan and Sovinjak). The remaining ten castles (Gradinje, Grdoselo, Kašćerga, Kožljak, Letaj, Lupoglav, Posert, Rakalj and Vranja) were built in an inaccessible location so that settlements could not develop around them. After the demolition of the castle in Kašćerga, Lupoglav, Posert (new Belaj Castle) and Rakalj, new residences were built on a more accessible location, and the settlement developed subsequently.

1. Settlements with castles (Fig. 4)

Most of the settlements in Pazin County have a castle as an integral part of the settlement. In the Middle Ages, in the region of Istria that was not part of the Venetian Republic, with the development of the feudal system, owners of fifes built castles as administrative centres of their possessions. Around these castles small settlements - suburbs developed. The settlements have no administrative status.

Settlements which developed around castles can be divided into:

a) fortified settlements with a castle
A small settlement grew around the castle and was also fortified. The settlement generally served as the first line of defence of the castle.

b) unfortified settlements with a castle
In addition to fortified settlements with a castle as their core, a growing number of settlements were built along the access road and around the castle, which were not fortified. Such settlements are small in volume and simpler in structure.

c) fortified settlements with a castle and an unfortified suburb
Several settlements in Pazin County were formed by merging separate cores. The first core of the settlement developed around the castle and this settlement is always fortified. Due to favourable economic conditions, a new unfortified residential area developed on the approach to the fortified settlement with a castle.

2. Settlements separated from the castle (Fig. 5)

Several settlements in Pazin County had castles which were the core of nearby settlements due to their

Table 1: Spatial and arhitectural development of the settlements.

NO.	SETTLEMENT	COMUN/ OPĆINA	13. CENTURY, THE BEGINNING OF THE 14. CENTURY						END OF THE 15. CENTURY, THE BEGINNING OF THE 16. CTENTURY						THE BEGINNING OF THE 17. CENTURY					
			CASTEL/ WALL	SETTLEMENT			CHURCH		CASTEL/ WALL	SETTLEMENT			CHURCH		CASTEL/ WALL	SETTLEMENT			CHURCH	
				LOGGIA	KAŠĆA	MUNICIPAL BUILDING	PARISH	CONFATER.		LOGGIA	KAŠĆA	MUNICIPAL BUILDING	PARISH	CONFATER.		LOGGIA	KAŠĆA	MUNICIPAL BUILDING	PARISH	CONFATER.
1	BARBAN	X	X				X		X	X		X		X	X					
2	BELAJ														X					
3	BERAM		X										X							
4	BOLJUN	X	X				X		X	X	X		X		X					
5	BRSEČ	X																		
6	ČEPIĆ		X				X													
7	DRAGUĆ		X					X	X				X	X	X		X	X		X
8	GOLOGORICA								X				X	X						
9	GRAČIŠĆE	X	X				X	X	X	X		X		X					X	
10	GRADINJE						X		X				X							
11	GRDOSELO		X				X													
12	KAŠĆERGA		X				X								X				X	
13	KOŽLJAK		X						X				X		X					
14	KRŠAN		X				X	X	X	X	X				X				X	
15	LETAJ		X																	
16	LINDAR		X						X				X	X	X	X			X	
17	LUPOGLAV		X						X						X				X	
18	MOMJAN		X						X				X		X				X	
19	PAZ		X						X				X	X	X					
20	PAZIN		X				X	X	X				X	X	X				X	
21	PIĆAN	X	X				X								X					
22	POSERT								X											
23	RAČICE		X										X						X	
24	RAKALJ								X				X	X					X	
25	SOVINJAK		X						X				X	X	X		X	X		
26	ŠUMBER								X						X				X	
27	TINJAN	X							X	X			X		X					
28	TRVIŽ							X												
29	VRANJA		X						X						X					
30	VRH						X		X				X		X					
31	ZAVRŠJE		X						X						X				X	
32	ŽMINJ	X	X						X				X	X	X				X	X
	UKUPNO	**7**	**22**	**0**	**0**	**0**	11	5	22	5	2	2	16	10	20	1	2	2	12	2

size, the strategic importance (defence of the pass, roads and control of the territory), the size of fife and the importance of the owner, although they never lied within the settlement. The position of the castle provided good defence, but was unfavourable for the development of settlements around the castle.

At the foot of the hill on which the castle was built emerged smaller hamlets with a few houses. Castles separated from settlements due to topographic features but located in the immediate vicinity of the settlement can be considered the core of the settlement.

After the Uskok War in the early 17th century, severely damaged castles were abandoned and new houses or residences built on a more accessible terrain.

3. Settlements without a castle (Fig. 5)

The last type of settlements that occurred in Pazin County is a settlement without a castle as the core. In the centre of such settlements lies a local square. This type of settlements has an administrative status of communes. All such settlements were fortified. In settlements that have a hill fort as the foundation, the local square is at the highest point in the settlement.

The tissue of settlements

Within the limits of historic cores of the selected settlements field research of the preserved historic settlement tissue – micro urban units (blocks, streets, squares) was conducted. It included an inventory of all historic buildings recorded in the cadastre of the early 19th century, available graphics and/or previous plans.[19]

No housing blocks were found in analyzed settlements. The earliest urban structure of settlements in Pazin County were row houses. Row houses consist of small, single-housing units lining the longer side of a street, with a maximum carrying range of up to six meters. Any subsequent house rationally exploits the wall of the adajcent house. These houses have a ground floor, the first floor and an attic/loft. A row of houses is separated from the parallel series of outbuildings by a narrow street. A row of houses establishes a street in the settlement, while outbuildings are in the second row.[20]

Rows and plots that form them make up a relatively rigid part of the urban fabric. Readjustments of plots, establishment of new streets or extension and rectification of older ones are rare. Former street directions (control lines), as well as parts of the town, which they have essentially formed, especially in the centre of the settlement, are the result of a continuity in building - a new house was built on plot of the earlier medieval house.

The oldest examples, built in the 13th century, are streets with row houses placed perpendicular to terrain contour lines. The best preserved examples of such structures are visible in Draguć, a fortified settlement by a castle, and in Boljun, in rows perpendicular to the castle (Corsini, 1997, 35-38).[21]

Row houses built between the 14th and the 17th centuries were laid parallel to the terrain, but retained the separation of houses and outbuildings. In the unfortified suburb of Draguć, in the 15th century, the main street follows the crest of the ridge with the row of houses and a parallel row of outbuildings. In Boljun, in the 15th century, the main street was formed, connecting the castle with the church of St. George. The street comprises of a row of residential buildings with many farm buildings in the second row.

In smaller settlements, formed by stringing buildings along the road leading to the castle, there is a similar organization, though not so clearly separated into rows of outbuildings and houses.

Beginning with the 18th century, enclosed rural complexes (enclosed blocks of buildings with inner courtyard) were being built on the edge of settlements. Residential buildings in the block are set on the edge of the block, oriented toward the street in the settlement, while outbuildings/farm buildings close off the block towards the edge of the settlement.[22]

Streets in settlements

Streets in settlements in Pazin County can be divided into two types:

1. housing streets (primary streets)
2. outbuildings streets (secondary streets).

Division of streets depends on the function of buildings that make up the street. Streets formed by houses are primary streets, where the settlement maintains its daily communication. Secondary streets are comprised of outbuildings (farm buildings) and used for everyday economic activity; they are in the second row and can

19 It was not possible to define separate parts of the settlement using the parcel boundary because the structure of the settlement and the development of the settlement were not based on the housing blocks organization, but on the solid position of the castle whose physical position was not subjected to change.

20 Residential house as part of the settlement tissue is much more flexible than the land ownership on which it was built, and any change in the plot was carried out with the appropriate legal regulations and possessory documents. The structure of plots and ownership relations between owners and users has not changed in Istria, regardless of the political situation and the war.

21 The described method of formation of row houses in Pazin County and the region can simultaneously be followed in Italy in much larger cities from the 13th to the 19th century. In these cities the Roman *domus* was divided into smaller, single-units, the so-called *casa in linea*.

22 In Boljun, in the 18th century, a block of buildings was created within the settlement. The block developed from two separate rows of houses. The street between the rows became an inner courtyard. Similarly to Boljun, in Sovinjak, also in the 18th century, two residential rows were combined into one block. The street between the rows became an interior courtyard and a new building was built toward the main square. In Barban, small hamlets were built on the northern edge of the village in the 19th century.



Fig. 6: Gračišće, a view of the secondary street, photo: I. Huic.

be considered as part of the farm yard (Fig. 6). Until the end of the 17th century, there was no distinction between the main and side streets in any of the settlement (Huić, Šćitaroci, 2015c, 212-215).[23]

With the construction of larger houses and palaces in the late 17th and 18th centuries settlements began to articulate main axes (Huić, 2015a, 68).[24]

The shape and forming of the square (Fig. 7)

In front of the city gates or the entrance to the castle, in the open space within the settlement, the local square and the traditional space "under the hackberry tree" was formed, together with the stone table and benches. The main square in Istrian settlements became, over the centuries, a prominent spatial sign, an important landmark for trade and meetings. Located on the square was the town loggia, a church with a bell tower and a well.[25]

In larger settlements, historical communes such as Gračišće, Tinjan or Barban, the main square is the centre of life. It is located in the centre, surrounded by public buildings.

In smaller towns such as Račice, Sovinjak or Gologorica, the main square is an expansion of the road leading to the castle.

The development of the square in Barban, located in front of the castle and the church, was completed in the 18th century with the construction of the Loredan

23 In Gračišće, one of the largest settlements in the County, it is impossible to distinguish between the main and the side streets as all residential (primary) streets are the same width. Pod Fumu street is the same width as the street connecting the main square with the church of St. Pancras or as the street connecting the church of St. Euphemia with the church of St. Pancras. In Pazin, in the fortified citadel, it is too impossible to distinguish between the main and the side streets. All of them can be considered residential streets.

24 In Barban, in the 18th century, with the building of new houses, such as the Stankovic Palace, the formation of the main axis connecting the eastern and western town gates was completed. In Pazin, in the 19th century, by building larger town houses in the suburbs the main street of the town was formed, connecting the castle (citadel), Buraj and suburbs. In the region, similar processes occurred several centuries before. The best example is Contrada Grande street in Conegliano. Building larger noble (civic) houses during the 16th century in the area between the eastern and western town gates articulated the new main city axis which became the new centre of the town.

25 The tradition of meeting "under the hackberry tree" was not entirely replaced with the building of the town loggia. The main square in Tinjan is in front of the parish church while the tradition of meeting "under the hackberry tree", preserved until the present day, took place in a separate space in front of the former town gate.

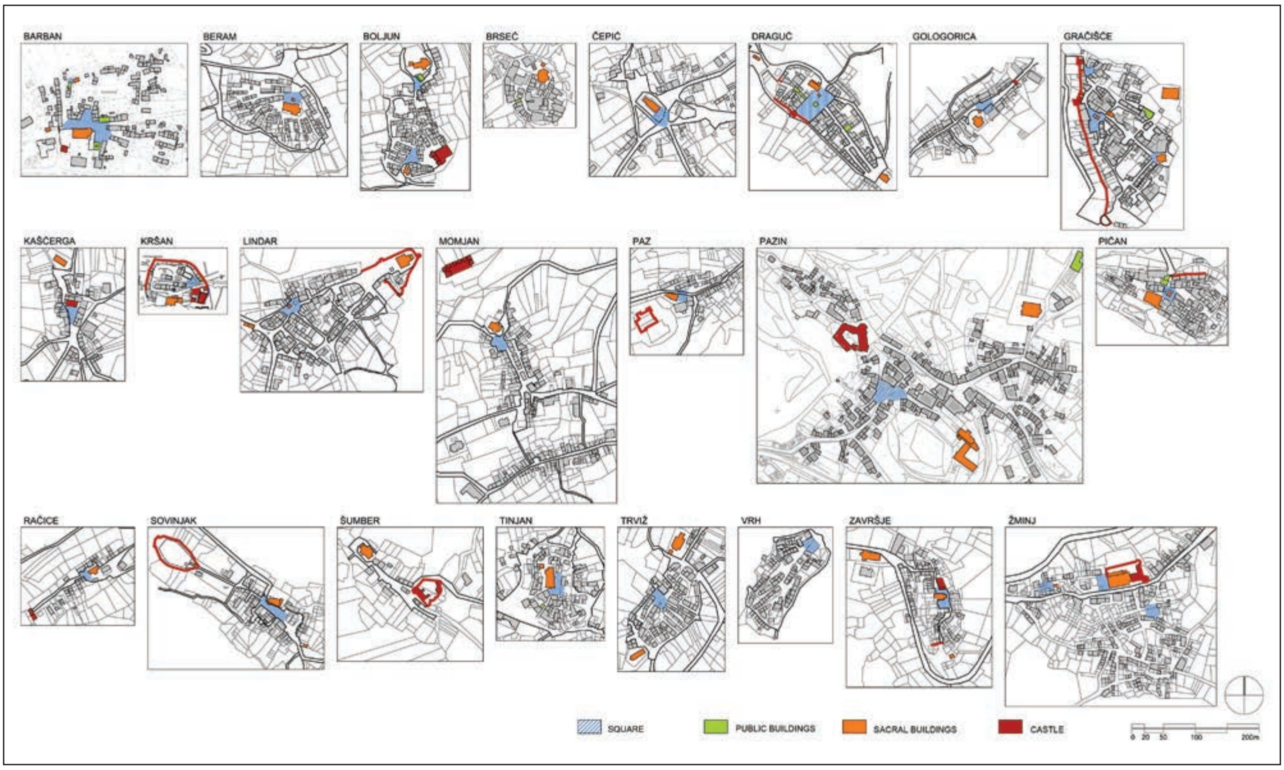


Fig. 7: Squares in settlements, author: I. Huic.

palace. On the square, next to the castle and the parish church, from the 16th century there is also a standard measure of trade, urban reservoirs and the loggia.

An interesting case in Draguć, where the today's main square was formed at the junction of the fortified and the un fortified suburb, in front of the fortified part of the settlement with a castle. The church tower, built in the 19 century, and the reservoir were later additions (Huić, Šćitaroci, 2012, 334).

In larger towns such as Barban, Tinjan and Gračišće, in front of the fraternity churches small squares were formed, creating a separate centre within the settlement. These squares are surrounded by residential buildings. In Gračišće, in front of the church of St. Euphemia and the church of St. Pancras small squares were formed, connected by streets with rows of houses. In Barban, in front of the fraternity church of St. James and the hospice in the northern part of the settlement, a small square was formed (Huić, 2015a, 66-69, 133).

Public buildings (Fig. 8)

Buildings important for the development of settlements, such as the church, municipal buildings (water reservoirs, wells and the like.), the castle, walls and gates were analysed. Determining the year of construction of these buildings is important because the comparison of stylistic features contributed to determining the time of construction of other buildings in the settlement, and thus to the development of the settlement.[26]

The most common public building in the settlements is the parish church which was built in 24 settlements. In addition to the parish church, in larger settlements, smaller fraternity churches were built (7 settlements). The town loggia was built in 8 villages, a granary with a loggia in 4. Town reservoirs/wells and the captain's office (town hall) were built in 2 settlements, both from the 16th century during the Venetian Republic. In Gračišće and Pićan there is the Bishop's Palace. Feudal lords or stewards of the fiefdoms and fraternities in Pazin, Barban and Gračišće built a hospice.

a) Sacral buildings

The parish church is usually positioned in the centre of the settlement, on the square. Some parish churches were surrounded by a cemetery. In addition to the parish church, fraternity churches were also built.

26 The chronology of construction is connected with the chronology of construction of the castle. Connecting the chronology of castle construction with the chronology of constructing the most important buildings in the settlement gives new information about the dynamics of the spread of residential areas in the settlement.

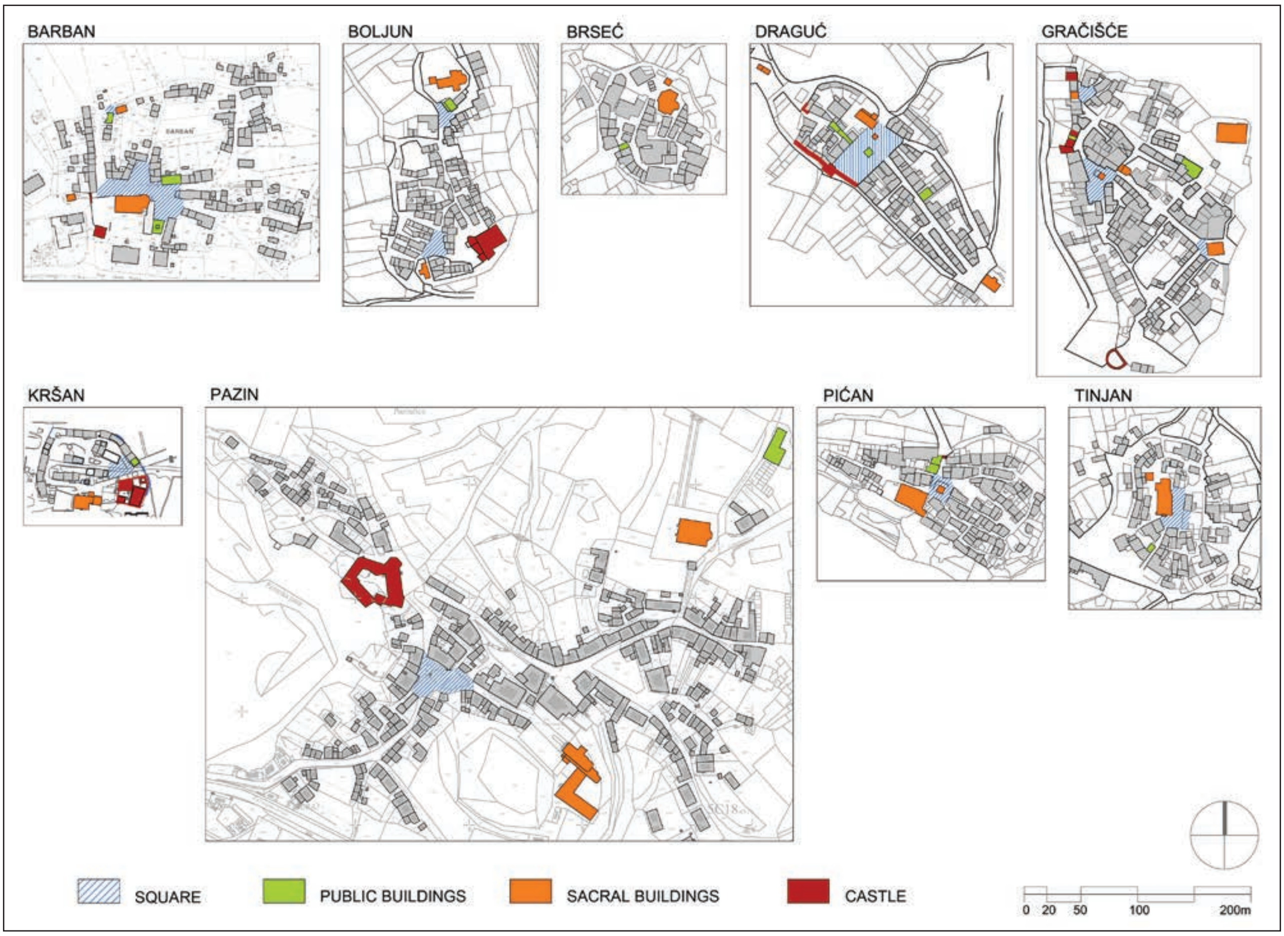


Fig. 8: Public buildings in settlements, author: I. Huic.

Exceptions to placing the parish church in the centre of the settlement, on the main square, are found in Lindar, Gračišće and Vrh. The parish church in Vrh was built at the entrance to the village. Around the church was a small graveyard. The parish church in Gračišće was built on the northern edge of the village. It also has a cemetery.

Besides churches, monasteries also had an important role in the urban and the development of areas in which they were founded. In Pazin County only one monastery was built, the Franciscan monastery in Pazin. In front of the monastery a smaller settlement Buraj developed. [27]

b) The town loggia

There are 7 loggias in Pazin County. The loggias in Boljun, Kršan and Tinjan, according to their architectural features, can be placed in the 16th century (Bradanović, 2008, 12; Huić, 2015a, 176). The loggia in Kršan was built in the 16th century as part of the major renovation of walls and the settlement (Fig. 9). Loggias in Gračišće and Brseč are located within town gates and are in fact just stone benches against the wall.

Loggias in Rakalj and Barban, along with other communal buildings, were built also in the 16th century, but only after both settlements came into the possession of the Venetian Republic following the war in the early 16th century (Huić, 2015a, 65; Klen, 1964, 23-26).

c) The municipal building

Generally speaking, municipal buildings are not common in settlements in Pazin County. The captain's office or the municipal palace was built in settlements after the 16th century, when some settlements came under the rule of the Venetian Republic.

In Barban and Rakalj the captain's office was built in the 16th century, in Draguć the municipal building was built in the 17th century and in Sovinjak, in the mid-

27 There were two monasteries in Pazin County, one in Sv. Petar u Šumi and another one on Lake Čepić. These monasteries, since they were not built within a village, were not considered in this study.



Fig. 9: Loggia in Tinjan, Kršan and Boljun, photo: I. Huic.

dle of the village, the communal palace was built in the 18th century.

In places with a lesser degree of communal freedom, such as Beram, Draguć or Završje, there were gastalds' houses.

A special case is that of Pićan, which was the seat of the diocese. There is the Bishop's Palace in the village, which is also the seat of administrative power. The bishop had another palace in Gračišće, his summer residence, but Gračišće as a commune had autonomy.

Defensive framework of the settlement (Fig. 10)

Of the 32 settlements in the County, it can be argued that 15 were fortified, and 17 villages had some kind of a defensive structure – a tower or a castle. Other settlements were not fortified.

The following types of defensive structures can be found:

1. castle or tower - 17 settlements (53.12%) (Barban, Beram, Boljun, Čepić, Draguć, Kašćerga, Kršan, Lindar, Momjan, Paz, Pazin, Račice, Sovinjak, Šumber, Trviž, Završje, Žminj)
2. walls around the settlement with towers - 15 settlements (46.87%) (Beram, Boljun, Brseč, Draguć, Gologorica, Gračišće, Kršan, Pazin, Pićan, Sovinjak, Tinjan, Trviž, Vrh, Završje, Žminj)
3. city gates - 12 villages (37.5%)

a) fortified entrance "on key" - 4 settlements (12.5%) (Draguć, Gračišće, Pazin, Pićan)
b) entrance tower - 3 settlements (9.37%) (Brseč, Tinjan, Žminj)
c) unfortified entrance - 5 settlements (15.62%).

a) Town walls

Walls follow the layout of settlements and are strongly associated with the network of streets in settlements, following the terrain on which towns developed. On the majority of preserved walls and castles, as well as on Valvasor's graphics from the late 17th century, it is evident that town walls and castles had towers with merlones, sometimes Ghibelline, rarely machicolations and other additional elements for the defence. The oldest known town walls can be dated to the period from the 12th to the 14th century, and their remains are preserved in Gračišće and Boljun (Huić, 2015a, 76-77; Huić, Šćitaroci, 2015c, 212). [28]

Most of the defensive walls and city gates were demolished during the 19th and early 20th centuries because they were obstructing traffic (Huić, 2015a, 85,70, 146-148). [29]

b) Entrance to the settlement

The majority of settlements do not have a preserved city gate or an entrance to the settlement. Analysis of the cadastre, Valvasor's graphics, the remaining surviving examples and historical data confirm that most of the settlements had an entrance through *propugnaculum* and "turnkey". Entrance to the settlement through an entrance tower is only represented on historical prints. Gates built after the 16th century were mostly symbolic in nature, marking the entrance to the settlement.

c) The tower

As with walls, most of the information regarding the appearance of towers within town walls and castles comes from Valvasor's graphics. Parts of the oldest preserved tower are found in Gračišće and Pićan.

There are two preserved towers in Gračišće: one with a town gate (nowadays within the Salamon palace) and one in the north-west corner of the town.[30]

28 The west line of town walls in Gračišće, built into houses, is preserved. The walls were built starting from the 12th century and encircled the entire settlement. They are visible in Valvasor's graphics and the model of Gračišće from the 16th century. The walls had battlements with merlones, and the most exposed parts were reinforced by defence towers.

29 The town gate in Boljun was demolished after World War II. In Barban, Tinjan and Pazin walls were torn down in mid19th century.

30 In the tower in the north-western corner of the village, on cadastral parcel * 1 and 105/2, a loophole is evident on the ground floor of a residential building whose features correspond with loopholes from the 12th to the 14th century. In the wider region similar loopholes can be found in Kobdilj, Piran, Završje, Momjan and Pietro Pelosa castle.

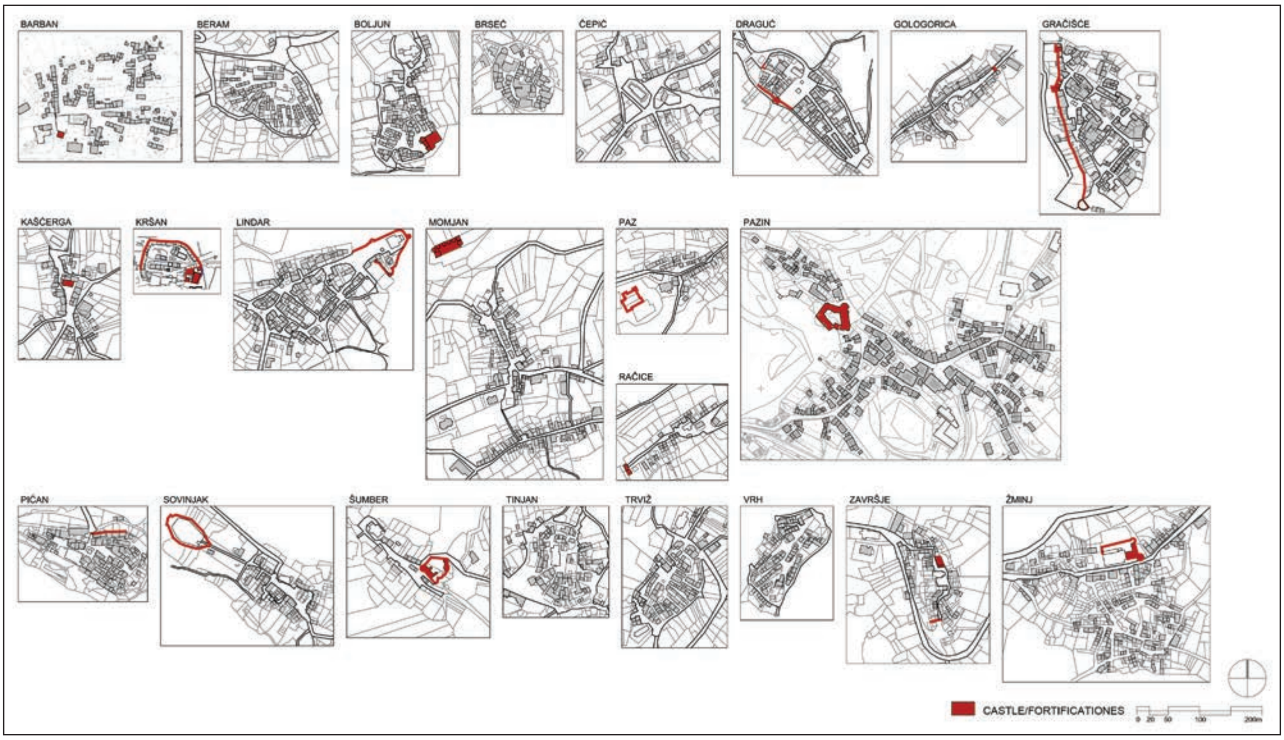


Fig. 10: Defense buildings in settlements, author: I. Huic.

d) Castles

Generally speaking, castles built in Pazin County in the Middle Ages, as in the wider region, were generally subordinated to the defence of the fife and the borders. They have a simple rectangular floor plan with a prominent guard tower in one corner. The oldest castle remains from the 12th and 13th centuries have been preserved in Boljun, Barban, Kršan and Pazin. From the 13th century onwards, palaces were built next to the guard tower. The construction of a palace in Istrian castles was concurrent with the construction of palaces in castles in Friuli (Piuzzi, 2001; Višnjić, 2008, 62-63). [31]

Of the 32 settlements, in areas which previously had a hill fort 9 settlements with castles were built whereas a brand new castle with or without a settlement was built in the other 23 locations. A guard tower existed it ten castles and two settlements, and sixteen of the castles had a palace. The most fervent construction of castles was in the 12th and 13th century, at the time when the fiefdom of Gorizia was the former in Istria.

According to current data, the castles were built:

A) on the hill fort location - 9 settlements and / or castles (28.12%) (Barban, Beram, Brseč, Boljun, Draguć, Gračišće, Pićan, Tinjan, Žminj)

B) newly built castles and / or settlements - 23 villages and / or castles (71.87%) - Belaj, Čepić, Gologorica, Gradinje, Grdoselo, Kašćerga, Kožljak, Kršan, Letaj, Lindar, Lupoglav, Momjan, Paz, Pazin, Posert, Račice, Rakalj, Sovinjak, Šumber, Trviž, Vranja, Vrh, Završje.

Construction date of the castle: a total of 23 castles

1) 10th century – 1 castle (4.34%) (Pazin)
2) 12th century – 6 castles (26.08%) (Barban, Boljun, Draguć, Rakalj, Sovinjak, Vranja)
3) 13th century - 12 castles (52.17%) (Čepić, Grdoselo, Kašćerga, Kožljak, Kršan, Letaj, Lindar, Lupoglav, Momjan, Paz, Završje, Žminj)
4) 14th century – 1 castle (4.34%) (Račice)
5) 15th century – 3 castles (13.04%) (Gradinje, Posert, Šumber)

COMPARISON OF SETTLEMENTS IN PAZIN COUNTY WITH SETTLEMENTS IN THE WIDER REGION

Review of urban and architectural features of identity of fortified towns and castles in the wider region offers the possibility of understanding both unique and common features associated with settlements in Pazin County (Sćitaroci, Huić, 2015a, 301-317; Marušić, 1999;

31 In Friuli, first buildings of such function emerged in the 12th century, as shown in a research of the Solimbergo castle and archival sources about the castle of San Daniele. In a document from 1203, two inhabitants of the castle of San Daniele described the castle and wrote that there was a palace in the castle. Palas in Solimbergo was built along the peripheral wall of the castle.

Schonfeld, 1855; Geromet, Alberti, 2011; Čeč, Darovec, 2009; Perbellini, 2011; Sanuto, 1509).

The wider region around Istria covers the area north and west of Istria, in northern Italy and southern Slovenia. Historically, these are parts of the province of Friuli and Kranjska (lat. Carniola; Germ. Krain). Feudal owners of the majority of possessions in the region were the counts of Gorizia and the Patriarch of Aquileia, while part of the territory was under the administrative authority of the Venetian Republic.

The research included settlements in the Venetian Istria (Svetvinčenat and Motovun), Kranjska and Gorica (Gorica, Prem, Štanjel and Socerb) and the settlements of Friuli (Conegliano, Portogruaro, Portobuffole, Seravalle and Ceneda).

The selected settlements for case study are located in strategic positions along the border with the Venetian Republic and along major transport routes. They were selected because there is a castle in the settlement, because of their narrow geographical location, their administrative status and the same feudal lords who have holdings in Pazin County.

Traffic position

The traffic position of Kranjska, Friuli and Gorizia is far more important than the traffic position of Pazin County. Important roads connecting Italy with Pannonia and the rest of Europe passed through Friuli, Kranjska and Gorizia.

Topographic position

Topographic position of settlements in the region, as well as in Pazin County, follows the relief characteristics of the terrain (river, ridge or knoll) on which each settlement spread.

In the Venetian part of Istria, in Svetvinčenat, the form of settlements adapts to the characteristics of the relief (sinkholes) with a street network that expands radially from the main square and the castle in the centre of the village. In Kranjska and Gorica the settlements of Prem and Štanjel also adapt to the terrain around their respective castles. In Štanjel the settlement envelopes the hill and the driveway to the castle. Prem spreads along the ridge and the pass between the parish church and the castle.

The layout of the settlement

The layout of a settlement depends entirely on the settlement's topographic position. Since the road network follows relief characteristics, settlements mostly have a linear or a complex layout. It should be noted that in settlements of Roman origin the street network and the layout are still typical Roman and do not adapt to the terrain.

Seravalle, in Veneto, adapts its shape to the pass; streets follow the shape of the pass and the road that runs through it. Fortifications on opposite hills protect the passage. Urban organization of Portogruaro follows the course of the river with the main and side streets. Portobuffole, situated by the river, has a Roman street grid, but it does not adjust its course.

The core of the settlement

Settlements with castles

When Pazin County is compared with the wider region, most of the settlements in Kranjska and Gorica developed by the road leading to the castle. These are mostly villages of artisans and merchants with the local inhabitants who lived next to the castle because they worked in the castle and for their protection.

The owners of the castle in Svetvinčenat organized a new centre of the settlement around the castle by designing and building a square in front of the castle with public buildings around it (the city loggia, the cistern and the church). The existing small settlement was oriented towards the newly built square. The main communication passes through the village, west of the new square.

In Motovun, a row of houses wraps around the hill, following the access road to the castle. As the settlement grew, new rings of fortification were built.

Around the Prem castle a settlement of merchants and craftsmen developed in front of its entrance. The settlement spread along the ridge during the 16th and 17th century.

In Štanjel a settlement, similar to the one in Motovun, developed on the slopes of the hill. When the construction of the new castle began in the 15th century, it was built inside the now fortified settlement, respecting the columnar structure of the settlement.

In the wider region, the town of Gorizia, as the centre of the Gorizia estate, developed by merging several separate cores formed around the castle into one. Around the castle, as in Pazin, a settlement of ministerials (so called citadel) developed. The unfortified medieval suburb of merchants and artisans developed near the fortified "upper" settlement. The suburb merged with the ancient village of Slocan and continued to spread, following the construction of the monastery. What makes it different from Pazin is the early unification of both settlements, fortified and unfortified suburbs, into one administrative unit with municipal rights. The administrative status of the new settlement, Gorizia, encouraged further development. [32]

Conegliano also developed next to the castle as a settlement in the citadel and the suburb at the foot of

32 The suburb of Pazin did not receive such administrative status until the 19th century, which caused delays in urban and architectural development of the town.

the hill. Owners of the fife very early started to join the defence systems of the citadel and the suburb.

Settlements without a castle

Among the analysed examples in the region, only Portogruaro is not fortified and does not have a castle. Portogruaro is a newly established settlement, from the 12th century, and was established by a feudal owner who wanted to increase his revenues from trade. The centre of the village consists of two town squares: one is the commercial (secular) and the other one the ecclesiastical centre of the town. As the settlement was not built at a strategically important location, but to be a trading centre, there was no need to build a castle.

The structure of settlements

In Gorica and Kranjska row houses also form the structure of settlements. Row houses are formed by the road leading to the castle and, unlike in Pazin County, primary/residential streets cannot be distinguished from secondary streets.

Row houses in Štanjel follow the road to the castle, while in Prem they follow the artery between the parish church and the castle.

Socerb in Gorizia is not surrounded by row houses, but by small family hamlets (farms with a residential building and other farm buildings enclose an inner courtyard) grouped to form a settlement at the foot of the castle.

In Portogruaro and Ceneda, unlike in Pazin County, Gorica and Kranjska, the settlement structure is made of blocks of buildings. The two settlements owe this block division, fragmented in the Middle Ages, to their Roman origin.

Form and genesis of squares

The examples analysed in Kranjska and Gorica show that squares are formed in front of the castle, as is the case in Prem and Štanjel. Squares in Gorica were created in front of the church and the monastery. Regardless of the fact that there is a settlement in the citadel and a suburb, a square was not created in Gorica at the junction of two settlements as it is the case in Pazin.

Examples in the Veneto and Friuli region show that the centre of the town is comprised of a square that developed on the crossroads of trade routes. The main square in Seravalle is in the middle of the pass, on the crossroads of trade routes. In Ceneda and Portobuffole, both settlements of Roman roots, squares are planned together with the grid of town blocks.

Portogruaro has two equally important squares, of which the first is the ecclesiastical centre and the second the trading centre of the town. This is not the case in Pazin County.

In the immediate vicinity of Barban, in the Venetian part of Istria, the main square in Svetvinčenat was built simultaneously with the reconstruction of the castle, the construction of the church, the water cistern and the town loggia. The owners of the fife, aside from the project of public buildings, designed a series of residential houses for rent that enclose the south side of the square.

Public buildings

Considering the development of settlements and factors of identity in relation to important buildings in the settlement, a number of common features with Pazin County can be seen.

Religious buildings

Construction of the parish church and smaller fraternity churches is essential for the development of settlements and their identity, regardless of the size of the settlement. The role of the construction of the monastery in the development of settlements is more evident in major towns in the region. In Gorica, the construction of the monastery prompted the establishment of large urban districts. In Conegliano, the construction of the monastery encouraged the spread of houses along the access road to the fortress and the monastery.

The town loggia / The building of the municipal administration

The construction of the town loggia and/or town administration buildings is related to the administrative status of a settlement. Similarly to Pazin County, if a settlement did not have an administrative status, there was no loggia in it. Settlements such as Socerb or Prem do not have any of these buildings.

In contrast, settlements bordering the Veneto and Friuli region, after being conquered by the Venetian Republic, gained greater municipal freedom, and similar happened in places along the Venetian border in Istria (Draguć, Barban, Rakalj or Sovinjak), where public and other communal buildings, such as a water tank or a granary, were constructed.

Defensive structures

Settlements in the region were mostly fortified, built next to the castle in the strategic position. Villages were used as the first line of defence of a castle (Štanjel, Gorica). Settlements built in a valley (Portogruaro, Seravalle), with the purpose to be trading centres, were not fortified.

Town walls

In the region, the remains of town walls of Novigrad and Piran can be compared with the examples from

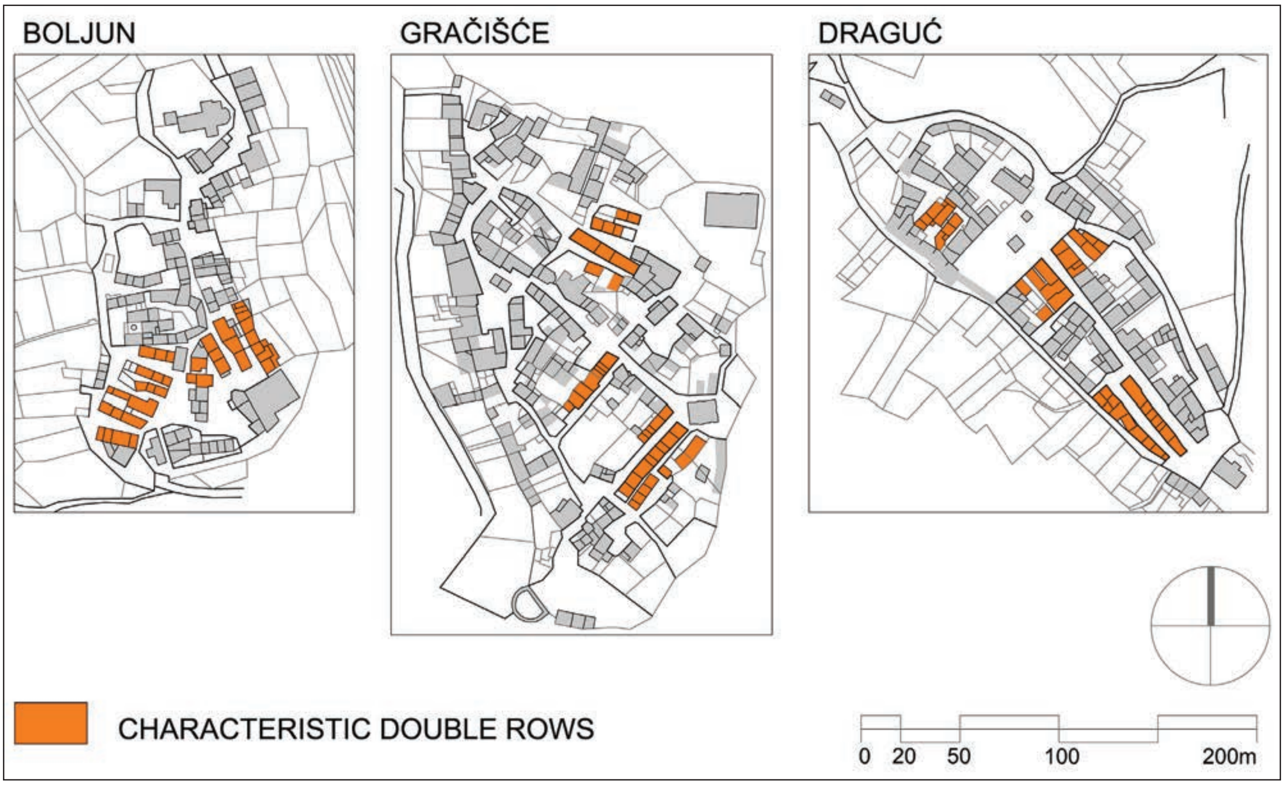


Fig. 11: Tissue and urban structure in Gračišće, Draguć and Boljun, author: I. Huic.

Pazin County. Novigrad and Piran town walls were built in the second half of the 15th century and early 16th century (1470-1533). The walls had two rows of loopholes and a path behind the battlements. Walls in Novigrad, as well as walls in Boljun, Kršan and Barban, have a battlement with a series Ghibelline merlons that are not only decorative. Ghibelline merlons are mostly used to accentuate the entrance to the castle or tower. The best examples are the battlements in Piran, the battlement on the bell tower in Završje and the battlement on the walls at the entrance of Štanjel (Bradanović, 2010, 11-15).

Entrance to the settlement

The organization of the entrance to a settlement or a castle in the region, directed by the logic of defence, does not differ from the examples in Pazin County.

From the surviving *propugnaculum* beyond the borders of Pazin County, an interesting example is the entrance to Hum. It was constructed in 1562, as confirmed by the inscription imbedded over the door. The same type of entrance, together with two lateral towers, is preserved in Mutvoran. Above the entrance gate to the castle in Hrastovlje, Slovenia, consoles from the bretaske have been preserved, with same dimensions as similar consoles from Kršan.

Castel

An important position on trade routes, especially of Friuli, then Kranjska and Gorica, initiated the construction of castles since the 3rd century. Fortifications were built along the north-western border with the Venetian Republic, and as in Pazin County, on easily defendable positions.

The appearance and features of fortresses and castles in the region are similar to those in Pazin County (although advanced solutions were imported with the delay). The application of advanced solutions depended on the financial strength of the owner. In the Pazin castle, the biggest castle in the County, the palace was built in the 13th century, at the same time when first palaces in Friuli were built (Piuzzi, 2001; Višnjić, 2008, 62-63).

CONCLUSION

Analysis of settlements and their historical development has exposed the factors of architectural and urban identity. The most important features of settlements are defensive walls and towers, their topographic position with the vertical of the bell tower at the highest point and the tissue and urban structure.

The tissue and urban structure are important identity factors of settlements in Pazin County. Similar struc-

ture is found in settlements of the Venetian part of Istria, but not in the wider region. In several settlements, like Gračišće, Draguć and Boljun, the medieval fabric of the settlement with characteristic double rows of residential and outbuildings and parcelling of the land are well preserved and today make up one of the distinguishing features of the historic centre (Fig. 11).

The walls with entrance towers and main gates (including *propugnaculum*) were also factors of urban identity of these settlements. In all historical graphics (e.g. Valvasor and Petronio's prints from the 17th century), defensive walls and gates together with churches are the most visible factors of identity of settlements. Today, settlements are still dominated by the parish church, but most of the walls have been demolished.

Other public buildings were not factors of urban identity of settlements. Their construction and /or demolition affected urban development, but not the identity of the settlement.

The contribution of this study is the comparison of settlement organization, the dynamics of their development and characteristics of urban elements of settlement in Pazin County with similar settlements in the region, in order to evaluate the development of Istrian towns in the area of similar geographical and architectural features. The medieval town of inland Istria, which had for centuries been an intuitive process of development outside the Roman urban model, developed the organic urban morphology to the extent that this recognizable Istrian example became synonymous with the medieval urbanism in the region. It is believed that in Istria medieval urban structure is almost completely preserved.

An additional contribution to the analysis of settlements and factors of identity, which was conducted by the described method, is an insight into the current condition and extent of preservation of the medieval structure of settlements in central Istria. In protected historic centres of Istrian settlements urban and architectural heritage is generally not explored. This statement is particularly true of medieval villages in the interior of Istria.

The analysis showed that settlements which are considered to be paradigmatic examples of well-preserved medieval towns, such as Draguć, for the most part were built in the 19th and 20th centuries. At the same time, analysis has shown that some settlements, like Barban, Gračišće or Kršan, are preserved to a greater extent, with a larger number of preserved medieval buildings than previously thought (Ivančević, 1966; Huić, Šćitaroci 2012, 336-337; Huić, Šćitaroci, 2015a; Krizmanić, 1999).[33]

The newly discovered data allows for a new evaluation and provides the initial guidance for the protection, preservation and sustainable development of architectural heritage of these settlements.

The issue of the administrative status of settlements and its link to the development of settlements in Pazin County was not fully confirmed. Historical communes (municipalities) such as Barban, Gračišće or Tinjan did preserve their status. When historical communes in the County are compared with settlements without an administrative status, it is evident that historical communes are bigger, stronger and better developed.

The impetus for further research involves comparing the structure of settlements, the dynamics of their development and characteristics of urban elements in settlements in Pazin County with settlements in the Venetian Istria and in the region.[34]

33 Analysis has shown that most of the settlement in Draguć was significantly altered in the 19th century. The most interesting results of the Draguć suburb analysis showed that what was preserved from the historic medieval building tissue were three residential rows in the centre of the village. The rest of the suburb was significantly altered during the construction modifications in the 19th century. In contrast to Draguć, settlements such as Barban, Kršana or Gračišće preserved large parts of the settlement's medieval structure from the 14th and 15th century. Owing to the houses on the main square with engraved years of construction from the 16th century onward, and because of Pod Fumu street, Gračišće is considered to be a settlement from the 16th century. There is a house in Pod Fumu with the year of construction from mid15th century. The analysis of houses in the street parallel to Pod Fumu (the street that runs toward the church of St. Vid) and a stratigraphic analysis of the structure of walls show there are houses built no later than the 14th century. The church of St. Pancras and St. Euphemia and parts of town walls were built in the 13th century. Gračišće, within the scope of town walls, has preserved large parts of the village from the 13th, 14th and 15th century. In Barban, following the completion of the stratigraphic analysis, buildings located in the centre of the settlement, around the main square, can be dated to the 15th century. Previous research considered Barban to be a settlement from the 19th century with parts of the preserved architecture from the 16th century.

34 This research is part of the scientific project *Heritage Urbanism (HERU) - Urban and Spatial Models for Revival and Enhancement of Cultural Heritage* financed by Croatian Science Foundation (HRZZ-2032), which is being carried out at the Faculty of Architecture University of Zagreb, under the project leadership of Prof. Mladen Obad Šćitaroci, Ph.D., F.C.A.

PROSTORSKI, URBANI IN ARHITEKTURNI ELEMENTI CENTRALNE ISTRE – PRIMER ZGODOVINSKE REGIJE PAZINSKE KNEŽEVINE

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POVZETEK

Naselja osrednje Istre, zgodovinsko območje Pazinske kneževine, so še vedno ohranila svoj srednjeveški značaj in obseg. To delo je del raziskave, ki proučuje razvoj istrskih naselij na območju podobnih zemljepisnih in arhitekturnih značilnosti. Obravnavani dejavniki identitete so topografski položaj naselij, tkivo in struktura naselij, obrambni okvir mest in značilnosti mestotvornih elementov naselij (prevladujočih prostorov in objektov) znotraj zgodovinskih središč naselij. V analizo je vključeno dvaintrideset srednjeveških naselij v Pazinski kneževini. Cilj raziskave je na podlagi zaznanih urbanističnih in arhitekturnih značilnosti, stavbne tipologije in drugih raziskovalnih rezultatov ovrednotiti obstoječe stanje na področju arhitekturne dediščine in okolja na opazovanem območju, z namenom izboljšanja stanja obravnavanih naselij in pokrajine. Najpomembnejše značilnosti srednjeveških naselij Pazinske kneževine so obrambna obzidja in stolpi, njihova topografska nastanitev z navpičnimi zvoniki v najvišjih točkah naselij ter značilne strukture in tkiva naselja. Srednjeveška tkiva in strukture naselij so, kot stoletni intuitiven proces razvoja naselij zunaj starodavnega mestnega modela, razvila organsko urbano morfologijo do te mere, da lahko prepoznaven istrski primer jemljemo kot sinonim za srednjeveški urbanizem regije. Podobno strukturo naselij najdemo v beneških delih Istre, ne pa tudi v širši regiji.

Ključne besede: Osrednja Istra, Pazinska kneževina, zgodovina urbanizma, dejavniki poselitvene identitete

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KRAJOLIK KAO PRIRODNO I KULTURNO NASLIJEĐE I POKRETAČ GOSPODARSKOG I DRUŠTVENOG RAZVOJA PRIMORSKO-GORANSKE ŽUPANIJE

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IZVLEČEK

Tema prispevka je krajina kot naravna in kulturna dediščina ter kot pomemben dejavnik identitete Primorsko-Goranske županije. V prispevku sta predstavljeni identifikacija in valorizacija krajinskih območij županije v dokumentih za prostorsko urejanje, v dokumentih za zaščito okolja in narave ter v izvedenih raziskavah krajine. Na izbranih primerih krajine je v prispevku raziskana uporaba metode, s katero želijo avtorji potrditi znanstveno utemeljen pristop ob novih posegih v prostore kulturne dediščine z namenom, da bi ta dediščina postala gonilo gospodarskega in družbenega razvoja, vendar pod pogojem ohranjanja njenih identitetnih vrednosti.

Ključne besede: krajina, Primorsko-Goranska županija, kriteriji, metode in modeli revitalizacije kulturno-zgodovinske in naravne dediščine

IL PAESAGGIO COME PATRIMONIO CULTURALE E NATURALE E VOLANO DELLO SVILUPPO ECONOMICO E SOCIALE DELLA REGIONE LITORANEO-MONTANA

SINTESI

Il tema di questa relazione è il paesaggio come patrimonio culturale e naturale nonché come fattore importante per l'identità della Regione litoraneo-montana. Nella relazione si spiega come le aree paesaggistiche della Regione vengono identificate e valorizzate a livello di documenti di pianificazione ambientale, di tutela dell'ambiente e della natura. Sulla base di paesaggi selezionati si analizza un metodo che tenta di affermare un approccio scientificamente fondato a nuovi interventi in aree del patrimonio culturale in modo che questo possa fungere da volano dello sviluppo economico e sociale, a condizione che ne venga tutelata l'identità.

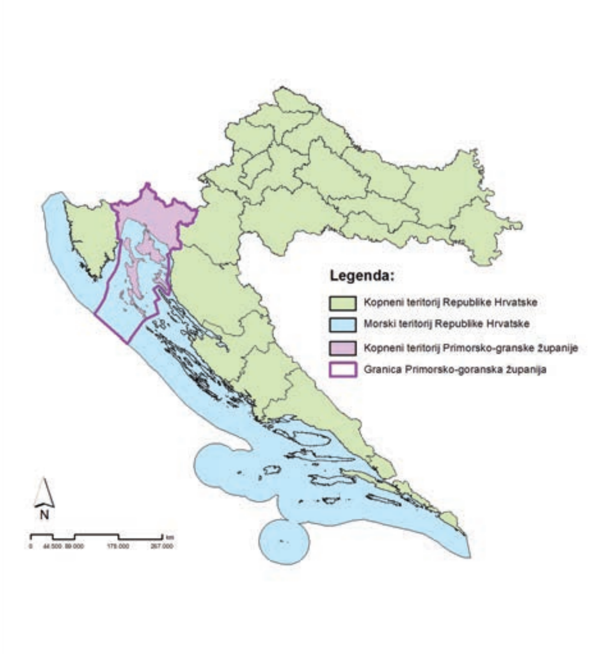
Parole chiave: paesaggio; Regione litoraneo-montana; criteri, metodi e modelli di rivitalizzazione del patrimonio storico-culturale e naturale

UVOD

Suvremeni stavovi o zaštiti kulturnog i prirodnog naslijeđa potiču povezivanje zaštite s urbanističkim i prostornim planiranjem na načelima održivog razvoja pri čemu se želi postići da naslijeđe bude pokretač i aktivni sudionik prostornog, društvenog, gospodarskog i turističkog razvoja. U središtu takvih pristupa, kao što je i Urbanizam naslijeđa (*Heritage Urbanism*)[1] jest kreativno, održivo i odgovorno korištenje urbanističkoga, graditeljskog i pejsažnog naslijeđa kao neobnovljivog resursa. Budući da Urbanizam naslijeđa (*Heritage Urbanism*) utvrđuje prostorne (urbanističke) kriterije, metode i modele za revitalizaciju i za nove zahvate u užem i širem prostoru kulturnoga naslijeđa, u ovome se radu oni istražuju na krajoliku kao kulturnom naslijeđu i to na području Primorsko-goranske županije, koja pripada Mediteranskom prostoru. U radu se daje naglasak na primjere kulturnog antropogenog krajolika iz priobalnog i otočnog dijela Županije pa su odabrana tri karakteristična primjera: povijesni urbani krajolik akropolskih gradića Kvarnera, povijesni agrarni – vinogradarski krajolik polja Pavlomir u Vinodolskoj dolini i Vrbničkog polja na otoku Krku te povijesni krški pašnjački krajolik vapnenačke zaravni iznad Baške na otoku Krku u kojem su dominantni antropogeni element suhozidi (gromače). Na ovim se primjerima istražuje primjena metode Urbanizam naslijeđa (*Heritage Urbanism*) kojom se želi afirmirati znanstveno utemeljen pristup prilikom novih zahvata u prostore kulturnog naslijeđa kako bi ono postalo pokretačem gospodarskoga i društvenog razvoja, ali uz uvjet očuvanja njegovih identitetskih vrijednosti.

PRIMORSKO-GORANSKA ŽUPANIJA – PROSTOR TRIJU FIZIONOMSKI RAZLIČITIH CJELINA, BOGATOG PRIRODNOG I KULTURNO-POVIJESNOG NASLIJEĐA

Primorsko-goranska županija[2] ima izrazito povoljan geografski položaj na zapadu Republike Hrvatske, na mjestu dodira srednje-europskog i mediteranskog prostora Europe (Slika 1).



Slika 1: Smještaj Primorsko-goranske županije na karti Hrvatske, izvor: GIS baza podataka Javne ustanove Zavod za prostorno uređenje Primorsko-goranske županije, 2016.

U fizičko-geografskom smislu sastoji se od tri fizionomski dobro izražene cjeline: priobalja s neposrednim zaleđem (34 % teritorija Županije), otoka (29%) i Gorskog kotara (37%) (Slika 2). Te cjeline nisu geografski homogene već se sastoje od više manjih morfogenetskih, pedoloških, hidrografskih, klimatskih i vegetacijskih zona.

Priobalje se proteže polukružno uz Riječki zaljev i Vinodolski kanal, između grebena Učke (1.396 m) na zapadu i rubnih planina Gorskoga kotara (Obruč 1.376 m, Tuhobić 1.109 m) na sjeveru i sjeveroistoku. Obuhvaća istočnu padinu Učke i prema sjeveru padine Ćićarije, odvojene udolinom. U riječkom je zaleđu prostrano Grobničko polje s nataloženim pleistocenskim šljunčanim naslagama. Iznad Bakarskoga zaljeva proteže se krasičko-hreljinski plato i prema jugoistoku plodni Vinodol. Niski vapnenački greben presijecaju vodotoci. Priobalje je većim dijelom građeno od vapnenaca mezozojske starosti između kojih se izdvajaju dolomitne zone. Mjestimično su preko vapnenačke osnove nataložene nepro-

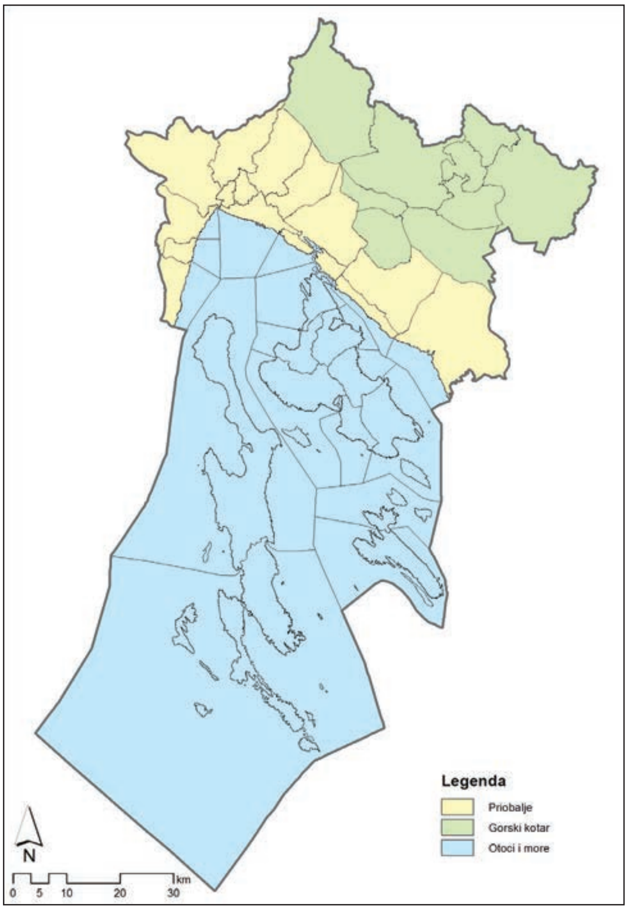
1 Ovaj je rad nastao u sklopu projekta Urbanizam naslijeđa/*Heritage Urbanism* (HERU) – prostorni i urbanistički modeli za oživljavanje i unaprjeđenje kulturnoga naslijeđa, koji se provodi na Arhitektonskom fakultetu Sveučilišta u Zagrebu, financira ga Hrvatska zaklada za znanost (HRZZ-2032), a voditelj Projekta je akademik Mladen Obad Šćitaroci.

2 Primorsko-goranska županija šesta je po površini hrvatskih županija. Od 7.990,57 km2 ukupne površine, kopneni i otočni dio zauzima 3.591,93 km2, a more 4.398.64 km2. Obala Županije izrazito je razvedena - ukupna dužina obale iznosi 1.117,52 km, od čega je 137,02 km obale kopno-more, a 980,50 km dužina je obale otoci-more. Prema popisu stanovništva iz 2011. godine na prostoru Županije živjelo je 296.195 stanovnika s prosječnom gustoćom 84,9 stanovnika/km2. U administrativnom smislu Županija se sastoji od 14 gradova i 22 općine s 536 naselja, a najviše je gradova smješteno u priobalju. Grad Rijeka sa 144.043 stanovnika poslovno je, upravno-administrativno, gospodarsko i kulturno središte Županije. Geoprometni položaj na raskrižju važnih europskih kopnenih i morskih putova utjecao je na to da se stanovništvo već od davnina opredijelilo za pomorstvo i druge gospodarske djelatnosti vezane uz more. Zato se ovo područje, a posebno Rijeka, razvilo u pomorsko središte s razvijenom lučkom, pomorsko-prometnom, brodograđevnom i turističkom djelatnošću od značenja za cijelu Hrvatsku, a Gorski kotar u šumarsko i drvoprerađivačko područje (Primorsko-goranska županija, Županijska skupština, 2005, 15-17).

pusne naslage paleogenog fliša što je uvjetovalo reljefnu izmjenu usporednih vapnenačkih grebena i dolomitnih ili flišnih udolina. Podzemnim tokovima iz planinskog zaleđa nastaju brojni izvori od opatijskog preko riječkog do vinodolskog primorja kojima se napajaju vodovodi obalnih gradova i naselja. Područje priobalja obilježava pretežito mediteranska klima s utjecajem planinske klime (bura, kiša i snijeg) tijekom zimskih mjeseci.

Goranska subregionalna cjelina obuhvaća visoravni, manja polja i doline Gorskog kotara, visoke gorske predjele Risnjaka i Snježnika te dolinu rijeke Kupe. Osnovnu stijensku podlogu sačinjavaju karbonatni mezozojski i paleogenski kompleks te kompleks paleozojskih i trijaskih klastita. Najviši planinski vrhovi u zapadnom dijelu Gorskog kotara su Risnjak (1.528 m) i Snježnik (1.506 m), a u jugoistočnom Bjelolasica (1.534 m) i Viševica (1.428 m). Između njih proteže se niža središnja zona dolinama rijeka Dobre i Kupe. Planine Gorskog kotara sprječavaju širenje toplinskog utjecaja Jadranskog mora u unutrašnjost, a velika nadmorska visina utječe na povećanje količine padalina te se ta cjelina odlikuje umjereno kontinentalnom do planinskom klimom. Područje Gorskog kotara je slabije naseljeno, što se odražava i na gospodarske djelatnosti, među kojima su najvažnije drvna industrija i šumarstvo. Bogati šumski i vodni resursi, raznolikost flore i faune te iznimna kvaliteta zraka dobra su podloga za razvoj turističkih djelatnosti.

Otočna cjelina ima izrazite značajke mediteranske klime, a sastavljena je od dva niza otoka - zapadnog s Cresom i Lošinjem i nekoliko manjih otoka te istočnog s Krkom i Rabom i manjim nenastanjenim otocima. Kvarnerski otoci su površinom i brojem stanovnika najveći na Jadranu, a karakteristične gospodarske djelatnosti su turizam, ugostiteljstvo te djelomično poljoprivreda i ribarstvo. Cres i Lošinj građeni su od krednih vapnenaca i dolomita. Vransko jezero na otoku Cresu, s razinom oko 13 m iznad mora, jedinstven je hidrografski fenomen na Jadranu, površine 5,5 km^2 i 74 m dubine (najdublji je dio jezera 60 m ispod morske razine) te sadrži više od 200 mil. m^3 iznimno čiste pitke vode kojom se opskrbljuju mjesta na otocima Cres i Lošinj. Sjeveroistočni i istočni dijelovi otoka Krka i Raba, za razliku od srednjih i jugozapadnih predjela, imaju manje plodnog tla i skromniju vegetaciju što je rezultat meteoroloških uvjeta, posebno bure. Krk se sastoji od tri reljefno različita dijela: na sjeveru je niska vapnenačka zaravan; u središnjem djelu je zbog izmjene vapnenaca i dolomita reljef blago valovit i prekriven vegetacijom, dok južni dio zauzima približno trećinu površine otoka, od čega gotovo polovica otpada na 350-400 m visoku vapnenačku zaravan. Rab se sastoji od četiri uzdužne zone - dvije flišne i dvije vapnenačke. Izmjena propusnih i nepropusnih stijena na otoku uvjetovala je nastanak brojnih izvora.



Slika 2: Tri subregionalne cjeline Primorsko-goranske županije – priobalje, otoci i Gorski kotar, izvor: GIS baza podataka Javne ustanove Zavod za prostorno uređenje Primorsko-goranske županije, 2016.

Različitost opisanih geografskih cjelina omogućila je i raznolikost krajolika koja proizlazi iz činjenice da na ovom području nalazimo i more i rijeke, prirodna i umjetna jezera, planine, šume, velike i manje otoke, brojne slikovite uvale duž iznimno razvedene obale, obalne gradove, stare akropolske gradiće, sela, poljoprivredne površine, polja, pašnjake i travnjake.

Različitost prirodnih uvjeta omogućila je i bogatstvo flore i faune[3] te vrijednih prirodnih područja. Na području naše Županije trenutno je zaštićen 31 vrijedan dio prirode.[4] Europskom ekološkom mrežom Natura

3 Biljni svijet Županije broji više od 2.700 vrsta višeg bilja, među kojima je mnoštvo endema, čime ovo područje pripada u floristički najbogatije dijelove Hrvatske. Pojedini otoci imaju više od 1.300 biljnih vrsta, što je više nego u mnogim prostorno većim europskim državama. Na području Županije boravi 81 vrsta sisavaca, što je gotovo dvije trećine svih poznatih vrsta sisavaca u Hrvatskoj, kao i mnoge rijetke i ugrožene, kao i endemske vrste među kojima se ističe podzemna krška fauna (Grupa autora, 2015, 9).

4 U kategoriji značajnog krajobraza zaštićeni su: Vražji prolaz i Zeleni vir na području Općine Skrad, Kamačnik na području Grada Vrbovskog, Lopar na otoku Rabu i Lisina na padinama planine Učke. Izvor podataka: Upisnik zaštićenih područja Uprave za zaštitu prirode Ministarstva zaštite okoliša i prirode Republike Hrvatske.

2000 obuhvaćeno je oko 75% kopnene površine i oko 16% mora te 110 lokaliteta.[5]

Duga povijest naseljavanja ovoga kraja od prapovijesti do današnjih dana rezultirala je bogatim i vrijednim kulturno-povijesnim naslijeđem koje je zaštićeno i upisano u Registar kulturnih dobara Republike Hrvatske – ukupno 428 nepokretnih kulturnih dobara, od čega 90 povijesnih cjelina (urbanih i ruralnih cjelina, etno zona, arheoloških zona i lokaliteta, memorijalnih područja), 285 povijesnih građevina (crkava, palača, kaštela, etnografskih i povijesnih spomenika) i 53 elementa kopnene i podvodne arheološke batine (Izvor podataka: Registar nepokretnih kulturnih dobara Republike Hrvatske, Ministarstvo kulture Republike Hrvatske, Konzervatorski odjel u Rijeci (stanje – siječanj 2016)).

Navedeno bogatstvo prirodnog i kulturno-povijesnog naslijeđa u velikoj mjeri određuje identitet Primorsko-goranske županije, a jedan od najvažnijih čimbenika njezina identiteta bogatstvo je i raznolikost krajolika.

IDENTIFIKACIJA I VALORIZACIJA KRAJOBRAZNIH CJELINA U DOKUMENTIMA PROSTORNOGA UREĐENJA TE DOKUMENTIMA ZAŠTITE OKOLIŠA I PRIRODE

Prema Sadržajnoj i metodskoj podlozi Krajobrazne osnove Hrvatske, prostor Primorsko-goranske županije pripada dvjema od 16 krajobraznih jedinica Republike Hrvatske: krajobraznoj jedinici Kvarnera i Velebita te onoj Gorskog kotara (Frangeš et al., 2014, 3). Tema krajobraza je u dokumentima zaštite okoliša i u dokumentima zaštite prirode Primorsko-goranske županije obrađena s posebnom pozornošću. Tako je u Izvješću o stanju okoliša iz 2003. godine (prepoznato više od 50 osnovnih tipova krajobraza te su izdvojeni značajniji primjeri, osnovne značajke svakog od njih, kao i njihova ugroženost, odnosno trendovi promjena. U Strategiji zaštite okoliša iz 2005. sačinjena je klasifikacija krajobraza u kojoj su prvi put zastupljeni i pod morski krajolici za koje se naglašava da bi, s obzirom na veliku atraktivnost podmorja Županije, mogli zbog povećanog zanimanja za njih postati posjećeniji, što bi rezultiralo povećanom potrebom njihove zaštite (Randić, 2010, 32). U Izvješću o stanju prirode na području Primorsko-goranske županije za razdoblje 2005.-2009. tabelarni prikaz tipova krajolika dopunjen je novijim podacima, naglašeni su mogući problemi prilikom planiranja, oblikovanja i zaštite krajolika te su na kraju dane smjernice za njihovo vrednovanje i zaštitu (Tabela 1).

U Programu zaštite prirode za razdoblje 2010.-2014. (2010) radi postizanja cilja zaštite krajobrazne raznolikosti utvrđena je među prioritetnim aktivnostima potreba izrade krajobrazne osnove Primorsko-goranske županije kao višegodišnji projekt. Kao pripremni doku-

Tabela 1: Tipovi krajolika Primorsko-goranske županije, izvor: autori, 2016, prema tabeli iz Izvješća o stanju prirode na području Primorsko-goranske županije za razdoblje 2005.-2009., autor Randić, M.

TIP KRAJOLIKA	ZNAČAJNIJI PRIMJERI U PGŽ
KOPNENI KRAJOLICI	
Pretežno šumski krajolici	
(Pret)planinski krajolici Gorskog kotara u pojasu klekovine planinskog bora i klekovine bukve	hrbat Snježnika, Risnjaka, Međuvrhi, Guslica, Planina, Jelenc, Medvejci, Crni vrh, Bjelolasica, vrhovi Burnog Bitoraja i Viševice, Bijele i Samarske stijene itd.
(Pret)planinski šumski krajolici Gorskog kotara	veći broj vrhova i kosa u području pretplaninskih bukovih šuma (Bukova gora, Bačva, Janjičarski vrh, V. Višnjevica, V. Javornica, Mirkovica, Janjčarica, Jasenovica)
Gorski krajolici u graničnom području primorja	Učka, dio Ćićarije, Obruč, Pliš, Tuhobić, Medveđak, Zagradski vrh
Kontinentalni gorski šumski krajolici na karbonatima	veliki šumoviti prostori Gorskog kotara
Krajolici šumskih kompleksa na klastitima Gorskog kotara	razlikuju se dva podtipa prema nadmorskoj visini i vegetaciji (bukva ili jela)
Krajolici kontinentalnih vriština, bujadnica i šumaraka	područje zapadnog dijela Grada Vrbovskog prema granici s Karlovačkom županijom
Gorski i brdski krajolici primorja (mediteransko-montanski krajolici)	Sisol i dijelovi južne Učke, Pliševica, Kamenjak, V. Tić, V. Stražište i brojni drugi predjeli
Šumski krajolici primorja – submediteran	priobalno područje od Brseča do Novog Vinodolskog

5 Usporedbe radi, Ekološka mreža Natura 2000 na području Republike Hrvatske obuhvaća oko 30% državnog teritorija, od čega 37% kopnenog teritorija i 16% površine obalnog mora. U Europskoj uniji Natura 2000 obuhvaća tek oko 18% teritorija (Grupa autora, 2015, 37).

TIP KRAJOLIKA	ZNAČAJNIJI PRIMJERI U PGŽ
Krajolici šumovitih kompleksa otoka – submediteran	Tramuntana, okolica Dobrinja, Dubašnica
Krajolici šumovitih kompleksa otoka – eumediteran	Punta Križa, Kalifront, Dundo na Rabu
Krajolici u kojima prevladavaju sađene borove šume primorja i otoka	Čikat, Pod Javori, Frkanj, Prniba i druge borove kulture
Krški krajolici i krajolici na submediteranskom flišu	
Brdski krajolici otoka (mediteransko-montanski)	Obzova, Hlam, Diviška, Kamenjak, Sis-Gorice, Osoršćica
Krajolici krških polja	Ličko polje, Grobničko polje, Gomance
Krajolici velikih bujičnih udolina u sub-mediteranu	Mošćenička draga, Lovranska draga, Banina, Mudna dol, Tomišina draga
Krajolici vapnenačkih strmaca flišnih udolina i kanjona primorskih tekućica	strmci Vinodola, Bašćanske kotline, kanjon Rječine i stijene oko izvora Rječine, Rebar na Draškom bregu, kanjon Draškog potoka u Martinšćici
Krajolici u erodiranom flišu i kvartarnim pijescima otoka i priobalja	Lopar na Rabu, Voz, dijelovi Učke i Vinodola
Krajolici periodičkih krških jezera	Kukuljanske ponikve
Krajolici urušenih krških ponikvi	Meraške jame, Sovjak
Krajolici submediteranskih ponikvi	Breški dol, Kneždol, Kapitovac, Bezjakov dol, Ugorovo, Blaž, Sipin dolac, Praputnjarski dolac, Svinjski dolac i mnoge druge sub-mediteranske ponikve
Krajolici pretplaninskih i gorskih ponikvi i uvala – mrazišta	Ceclje, V. Snežno, Viljska ponikva, Pribiniš, Lazac, Fratrovi dolci, Matić poljana, Kamerkin dol i mnoge manje ponikve i uvale Gorskog kotara
Krajolici podzemnih krških prostora	špilja Vrelo, Biserujka, Lokvarka, Bukovac pećina, Ledenica kod Mrkoplja i brojne druge špilje, jame i ponori u kršu
Krajolici kontinentalnih riječnih dolina	dolina Kupe, Kupice, Čabranke, Dobre
Krajolici s dominantnom ulogom slatkih voda	
Krajolici kanjonskih udolina Gorskog kotara	Vražji prolaz - Zeleni vir, Kamačnik, V. i M. Belica
Krajolici flišnih udolina s tekućicama – primorskim rijekama i potocima	dolina Rječine, klanjske Ričine, Sušačka Draga, Vinodol, Bašćanska kotlina, doline dobrinjskih potoka
Krajolici prirodnih jezera	Vransko jezero na otoku Cresu
Krajolici umjetnih slatkovodnih akumulacija	akumulacije Gorskog kotara, Tribaljsko jezero, Valići, Ponikve na Krku
Krajolici zamočvarenih kontinentalnih područja	Sušica kraj Gerova, jošici uz Dobru i druga manja močvarna područja u Gorskom kotaru
Krajolici zamočvarenih područja otoka	Jezero na Krku, nekoliko velikih lokvi
Krajolici cretova i tresetišta	cret Trstenik, cret Ponikve kod Tršća, i drugi maleni ostaci cretova u Gorskom kotaru
Poljoprivredni krajolici Gorskog kotara	manja polja oko naselja: Delničko, Mrkopaljsko i druga polja
Pretežno ruralni krajolici	
Poljoprivredni krajolici primorja i otoka	Vrbničko polje, Pavlomir u Vinodolu i dr.
Krajolici kamenjarskih pašnjaka nižih dijelova primorja i otoka	sjeverni i jugoistočni dio otoka Krka, Sv. Marko, veliki dijelovi otoka Cresa i Raba, dijelovi kopnenog priobalja
Krajolici kamenjarskih pašnjaka brdskih i gorskih dijelova primorskih padina, uvala i grebena	dijelovi Učke, Ćićarije, Pliševica iznad Škalnice, Pliš-Grmada iznad Klane, travnate padine Obruča, Pliš kod Gornjeg Jelenja, travnate padine Tuhobića, Pleteno i dr.
Krajolici pjeskovitih površina otoka	otok Susak, Srakane, Unijsko polje, Sv. Marak na otoku Krku

TIP KRAJOLIKA	ZNAČAJNIJI PRIMJERI U PGŽ
Pretežno urbani krajolici	
Urbani krajolici	Opatija, Rijeka, Kostrena, Bakar, Kraljevica, Crikvenica, Novi, Krk, Cres, V. Lošinj, Rab, Delnice….
Krajolici starih akropolskih primorskih gradića	Lubenice, Brseč, Mošćenice, Veprinac, Kastav
Priobalni krajolici	
Krajolici strmih litica kvarnerskih otoka izloženih buri	sjeveroistočna obala otoka Krka, Raba, Cresa, Prvića, Golog i Sv. Grgura, litice Plavnika i otočića Sv. Marka
Krajolici velikih morskih uvala plitkih obala	Soline/Klimno, Puntarska draga, dio Creskog zaljeva s močvarom Piskel
Krajolici duboko u kopno uvučenih morskih uvala plitkog dna	uvala Kolorat, Ul, Baldarin, Meli, Jadrišnjica, Martinšnjica, Kaldonta, Sonte, Sridnja, Vognišća, Mala Jana, Torkul, Sv. Juraj, Sv. Fumija i dr.
Krajolici duboko u kopno uvučenih morskih uvala strmih obala	Žrnovnica, Tepli porat Krušćica i dr.
Krajolici malih kvarnerskih školja i hridi	Zečje, Trstenik, Visoki, Oruda, Palacol, M. Plavnik, Kormati, Galun, V. Laganj, Lukovac i dr.
PODMORSKI KRAJOLICI	
Krajolici hridinastih dna	veći dio morskog dna uz obale otoka i priobalja, podmorske sike
Krajolici podmorskih litica	sjeveroistočne obale otoka Krka, Cresa, Raba, Plavnika, Prvića, Golog i Sv. Grgura, obalne stijene Brseča, Vele Stine na Unijama i drugdje
Krajolici podmorskih spilja	otok Prvić, Plave grote kod Lubenica, potopljena pećina na Lošinju i dr.
Podmorski krajolici šljunkovitog dna i dna grubih pijesaka	oko otoka Suska, Unija, Srakana, Ilovika, uz jugozapadne obale o. Lošinja, rijetko u Riječkom zaljevu i dr.
Podmorski krajolici pjeskovitih dna	manji dijelovi uzobalnog morskog dna otoka Krka, Raba i drugih otoka
Podmorski krajolici livada morskih cvjetnica	obale Lošinjskog i dijela Creskog arhipelaga, jugozapadne obale otoka Raba, obala ispred Stare Baške
Podmorski krajolici muljevitih dna	velik dio dubljih dijelova Riječkog zaljeva, Kvarnera, Kvarnerića i Velebitskog kanala
Podmorski krajolici detritičnih dna	ovom tipu pripada velik dio podmorja u akvatoriju južno od otoka Lošinja, ponešto južno od o. Raba, a manje uz ostale otoke
Krajolici hridinastih morskih obala	Veći dio morske obale na području PGŽ
Krajolici šljunkovitih žala/plaža	Bašćanska plaža, žalo u Mošćeničkoj dragi, Medveji i drugdje
Krajolici pješčanih žala	Uvala Crnika i još nekoliko uvala na otoku Rabu
Krajolici luka, marine	luke svih većih primorskih naselja, marine
Krajolici na nasutoj morskoj obali	Crikvenička rivijera, Ičići i mnogi drugi dijelovi nasute obale

ment izrađena je studija „Krajobrazi Primorsko-goranske županije – metodološka podloga za izradu krajobrazne osnove s posebnim osvrtom na zaštićene dijelove županije". Godine 2014. izrađen je dokument „Krajobrazi Primorsko-goranske županije – krajobrazna osnova, analize i razvojni okviri" u kojemu je napravljena tipološka podjela prostora Županije na 350 krajobraznih jedinica (Frangeš et al., 2014, 5).[6] Identificirana je 101 krajobrazna cjelina (Frangeš et al., 2014, 14) te je napravljena njihova preliminarna valorizacija kroz kvantitativne i kvalitativne indikatore[7], sve kako bi se prepoznali potencijalno iznimno vrijedni krajolici kakav je potenci-

6 Krajobrazne jedinice Primorsko-goranske županije klasificirane su na temelju pristupa zasnovanog na biofizičkim značajkama područja prema LANMAP metodologiji prema kojoj je razvijena nova hijerarhijska klasifikacija Europskih krajobraza. Sadrži četiri razine – osam klimatskih tipova, pet kategorija nadmorske visine, tri tipa tla i deset vrsta pokrova tla. Iz te je kategorizacije proizašlo 350 krajobraznih jedinica (Frangeš et al., 2014, 5).

7 Valorizacija je provedena kombinacijom kvantitativnih (indeks geomorfološkog bogatstva krajobraza, indeks izvornosti krajobraza, indeks kulturnih elemenata krajobraza, indeks značajnih prirodnih područja i staništa te indeks dinamičnosti krajobraza) i kvalitativnih indikatora (između niza kriterija kakvi su reprezentativnost, rijetkost, jedinstvenost, cjelovitost, ambijentalna vrijednost, estetsko-



Slika 3: Lubenice na otoku Cresu, autor: Randić, M., 2015.

jal utvrđen u trideset i četiri krajobrazne cjeline (Frangeš et al., 2014, 43). Među njima je najviše (19) prirodno--antropogenih krajolika: vršni predjeli Učke, liburnijske padine Učke, kanjon Rječine, Vinodol, Prvić, Goli otok, Tramuntana, Vransko jezero, Pernat - Lubenice – Halm, Osor – Nerezine, Punta križa, rapski krški pašnjaci, loparska šuma i uvale, brodsko-moravički plato, gornji tok Kupe sa pritocima, dolina Kupe (srednji tok), Begovo Razdolje - Matić Poljana, Fužine-Lokve i Dobra. Devet je pretežno antropogenih krajolika: urbani i suburbani prostor grada Rijeke, Dobrinj-Klimno-Šilo, Vrbnik i Vrbničko polje, Bašćanska dolina, platoi iznad Bašćanske Drage, kamenjarski pašnjaci Cresa, Veli Lošinj, Susak te Velike i Male Srakane. Šest je pretežno prirodnih krajolika: Grobničke planine - Gornje Jelenje, Bijele i Samarske stijene, Snježnik - Bukova Gora, Lazac - Šegine – Lividraga, Risnjak i Skrad-Tihovo.

Provedena je i analiza ranjivosti te su definirani okviri za upravljanje krajobrazima u svrhu izrade prostorno--planske dokumentacije (Frangeš et al., 2014, 40-42). Zaključno je istaknuto da je u cjelinama s potencijalno iznimno vrijednim krajobrazima nužno izvršiti terenski izvid, dokumentirati stanje, ocijeniti stvarnu iznimnu vrijednost krajobraza te osmisliti smjernice za očuvanje i razvoj takvih područja (Frangeš et al., 2014, 43). U županijskome prostornom planu istaknute su vrijednosti krajobraza koje je potrebno očuvati zasebno za svaku geografsku cjelinu – Gorski kotar, priobalje i otoke, a za zaštitu u kategoriji značajnog krajobraza predložena su brojna područja.

PRIMJERI KRAJOLIKA PRIMORSKO-GORANSKE ŽUPANIJE NA KOJIMA ĆE SE ISTRAŽITI PRIMJENA METODE URBANIZAM NASLIJEĐA (*HERITAGE URBANISM*)

U svim je navedenim dokumentima i radovima naglašeno da se na području Primorsko-goranske županije među najznačajnijim krajolicima izdvajaju oni koji su

umjetnička vrijednost i drugi, za potrebe izrade ove stručne podloge, odnosno preliminarne valorizacije krajolika Primorsko-goranske županije, odabrani su sljedeći indikatori: karakterističan krajobraz, jedinstven krajobraz, visoko-asocijativan krajobraz, visoka vizualna vrijednost) (Frangeš et al., 2014, 15-31).

oblikovani djelovanjem čovjeka. Najviše potencijalno iznimno vrijednih krajolika pripada mješovitom prirodno-antropogenom tipu. Stoga se u nastavku istražuje primjena metode Urbanizam naslijeđa (*Heritage Urbanism*)[8] na odabrana tri primjera krajolika karakterističnih za područje Primorsko-goranske županije: povijesnom urbanom krajoliku akropolskih gradića Kvarnera, povijesnom agrarnom krajoliku i povijesnom suhozidnom krajoliku otoka.

Na području Primorsko-goranske županije svojom neponovljivošću, posebnom ljepotom i očuvanim identitetom, ali i velikom ranjivošću, izdvajaju se **krajolici akropolskih primorskih gradića** kojima glavno obilježje daju stari srednjevjekovni kašteli izgrađeni na istaknutim i zaštićenim uzvišenjima (Randić et al., 2010, 32). U priobalju to su Brseč, Mošćenice, Veprinac, Kastav, Grobnik, Drivenik, Bribir, Novi Vinodolski, a na otocima Omišalj, Dobrinj i Vrbnik na Krku te Beli i Lubenice na Cresu (Slika 3).

Radi se o primjerima korištenja zemljišta prilagođenog prirodnoj krajobraznoj strukturi te o vizualno eksponiranim znakovitim uzorcima naselja i arhitektonskih elemenata u njima (crkve, zvonici, uske uličice, krovovi, arhitektonsko oblikovanje). Te su vrijednosti prepoznate u svim vrstama i razinama dokumenata prostornog uređenja te zaštite okoliša i prirode Primorsko-goranske županije, a povijesne jezgre naselja službeno su zaštićene rješenjima nadležnih konzervatorskih službi i upisane u Registar nepokretnih kulturnih dobara Republike Hrvatske u kategoriji kulturno-povijesnih cjelina, neovisno o činjenici da su mnoga pojedinačna nepokretna kulturna dobra unutar njih samih zaštićena zasebnim rješenjima. Tijekom niza godina jedinice lokalne samouprave samostalno, a posebno u suradnji s Primorsko-goranskom županijom, nastojale su s jedne strane zaštititi, a s druge strane revitalizirati te prostore kako bi oni ponovno postali žarištem interesa i mjestom okupljanja koje će kao prostorni i kulturni resurs unaprijediti gospodarski i društveni razvoj njihovih sredina. U tom smislu posebno je značajan višegodišnji projekt „Putovima Frankopana" čiji je cilj bila revitalizacija frankopanskih kaštela Vinodolske doline.[9] Za svaki je kaštel izrađena odgovarajuća projektna dokumentacija prema kojoj su izvedeni radovi. Izradi takve dokumentacije prethodila su znanstvena istraživanja i stručne konzervatorske analize iz kojih su, u suradnji s lokalnom samoupravom, proizašli prijedlozi za odabir optimalne buduće namjene. Tako je Grad Grobnik dobio izložbeni i muzejski prostor te polivalentnu dvoranu, što je predviđeno i za kaštel u Bakru; u dvorcu Nova Kraljevica planirano je uređenje Hrvatske kuće vina; u kaštelu Drivenik uređenje ljetne pozornice. U kuli u Bribiru uređen je izložbeni prostor, a u Novom Vinodolskom uređeni su prostori gradske uprave, svečana gradska vijećnica, muzej te knjižnica i čitaonica (Vahtar-Jurković, Margan, 2009). Revitalizacija takvih kulturno-povijesnih cjelina bazira se često na kulturnim festivalima, posebno ljeti kada mnogi trgovi ožive brojnim posjetiteljima festivala gitare i festivala čakavske šansone u Kastvu, festivala amaterskih kazališta u Omišlju i Grobniku, Lubeničkih glazbenih večeri … Recentni primjer revitalizacije zaštićene kulturno-povijesne cjeline mjesta Beli na sjevernom dijelu otoka Cresa zvanom Tramuntana[10] , iznimno vrijedne u krajobraznom smislu (Slika 4), bazira se na projektu uređenja centra za posjetitelje u zgradi bivše osnovne škole, primarno posvećenog očuvanju i zaštiti bjeloglavih supova, ugrožene Natura 2000 vrste, koji će ujedno biti i baza za znanstvena istraživanja i terensku nastavu Prirodoslovno-matematičkog fakulteta Sveučilišta u Zagrebu.[11]

8 U sklopu projekta Urbanizam naslijeđa (Heritage Urbanism) (HERU) uspostavlja se metoda kojom se želi afirmirati znanstveno utemeljen pristup prilikom novih zahvata u prostore kulturnog naslijeđa. Ona se, neovisno o kojem se tipu naslijeđa radi, bazira na utvrđivanju identitetskih vrijednosti naslijeđa kroz čimbenike identiteta temeljem kojih se utvrđuju kriteriji za njegovo vrjednovanje i za nove zahvate u tome naslijeđu. Prepoznaje se povijesni i/ili sadašnji model korištenja naslijeđa te se na temelju njega, te utvrđenih čimbenika identiteta i kriterija postavljaju osnove novoga, budućeg modela korištenja naslijeđa prilagođenog suvremenim potrebama, uvažavajući potrebu njegove zaštite i očuvanja (Obad Šcitaroci, 2015).

9 U Projekt „Putovima Frankopana" bilo je uključeno 10 kaštela na području gradova Bakar (kaštel u Bakru i gradina Hreljin), Kraljevca (dvorac Nova Kraljevica i Grad Zrinski) i Novi Vinodolski (kaštel s kulom Kvadrac i gradina Ledenice) te Općine Čavle (Grad Grobnik) i Općine Vinodolske (stari grad Drivenik, kula u Bribiru i ostaci gradine Grižane). Osmišljena je tematska turistička ruta istog naziva, za koju su izrađeni odgovarajući promidžbeni materijali, a svi su kašteli označeni jednoobraznim informativnim pločama, za što je Primorsko-goranska županija na pozivnom natječaju dobila sredstva Ministarstva turizma namijenjena promidžbi tematskih putova. (Vahtar-Jurković, Margan, 2009)

10 Posebnost Tramuntane u krajobraznom smislu su stare hrastove šume u kojima je stoljećima bio razvijen poseban način gospodarenja šumom – pedaljenje, uz istovremenu ispašu ovaca. Kao posljedica razvoja lovnog turizma pojavio se i vrlo je izražen problem alohtone divljači, a tradicionalni način života je u odumiranju pa je izražena sve teža prohodnost terena. Potreba zaštite i očuvanja ovog dijela otoka Cresa prepoznata je i detaljno obrađena kroz prostorni plan područja posebnih obilježja u kojemu su, na temelju kriterija estetske i ambijentalne vrijednosti harmoničnog krajobraza te vrijedne kulturno-povijesne i prirodne baštine, utvrđene mjere zaštite prostora, kao i mjere provedbe svih budućih zahvata s ciljem revitalizacije područja, uz zadržavanje stanovništva i povećanje kvalitete njihova života, očuvanja ekološke stabilnosti, racionalnog korištenja prostora i stvaranja prostornih mogućnosti za razvoj selektivnih vidova turizma (eko-turizam i agro-turizam), edukacije i rekreacije (poučne eko-staze, pješačke staze i dr.) (Prostorni plan područja posebnih obilježja Tramuntane, Službene novine Primorsko-goranske županije broj 4/2003, 2003).

11 U Projektu koji vodi županijska Javna ustanova za upravljanje zaštićenim dijelovima prirode „Priroda" sudjeluje više dionika, među kojima i lokalna Udruga „Tramuntana" (koja je u prostoru škole uredila etnografsku zbirku), kao i Udruga BIOM iz Zagreba (koja će skrbiti za supove) te Zoološki vrt iz Zagreba, kao i Turistička zajednica Grada Cresa. U dvorištu je već izgrađena volijera za oporavak ozlijeđenih supova, a na pogodnoj lokaciji u širem području Belog bit će uređeno i hranilište za supove. Na obje lokacije bit će



Slika 4: Krajolik mjesta Beli na otoku Cresu, autor: Randić, M., 2015.



Slika 5: Vinogradarski krajolik Vrbničkog polja na otoku Krku, autor: Rogić, I., 2015.

Drugi tip i pozitivan primjer očuvanja krajobraza pod antropogenim utjecajem su **povijesni agrarni (poljodjelski) krajolici** priobalja i otoka – vinogradarski krajolici Vrbničkog polja na otoku Krku (Slika 5) i Pavlomira u Vinodolskoj dolini gdje se uzgojem vinove loze održavaju plodne poljoprivredne površine. Vrbničko polje je takvim postalo nakon melioracije pedesetih godina prošlog stoljeća, a u Pavlomiru je provedena rekultivacija nakon Domovinskog rata te su se nastojala pribaviti sredstva za navodnjavanje iz sredstava domaćih i stranih fondova. Ovi su krajolici odabrani zbog činjenice da su takve veće poljoprivredne površine rijetke na području priobalja i otoka te zbog njihove agroekološke, estetske i ambijentalne vrijednosti znakovite ne samo za lokalni, nego i regionalni identitet.

Treći je primjer za područje Primorsko-goranske županije posebno značajnih **krških krajolika u kojima su dominantne gromače – suhozidi**, koje vrednujemo kao antropogene građevine u krajoliku. Znakovite takve predjele nalazimo na području Općine Baška, gdje se u turističkoj promidžbi nude šetnje ovim pustim kamenjarskim površinama s kojih se pružaju prekrasni vidici prema moru, Velebitu i okolnim otocima pod atraktivnim nazivom Mjesečeva staza. Posebno su obilježje tih predjela slikoviti mrgari – suhozidne višeprostorne ovčare, koje kao gotovo nestvarni golemi kameni cvjetovi ukrašavaju općinska pasišta (komunade) (Slika 6).[12] Na području iste vapnenačke zaravni su i jedinstvene lokve koje su vjekovima omogućavale ispašu ovaca i time život lokalnog stanovništva. Posebno je slikovit primjer lokve Diviške u koju se spuštaju suhozidi koji omoguću-



Slika 6: Pašnjački krajolik vapnenačke zaravni iznad Baške na otoku Krku, autor: Randić, M., 2015.

omogućeno promatranje ptica, ali na način koji ih neće uznemiravati. U predmetnom slučaju radi se o pozitivnom primjeru revitalizacije gotovo napuštene povijesne jezgre i posebno jedne od povijesnih građevina u njoj primjerenim sadržajem, o povezivanju sa zaštitom ugrožene Natura 2000 životinjske vrste, a sve to u sinergiji lokalne i regionalne uprave, sveučilišne zajednice te lokalnih i stručnih udruga.

12 Radi se o pasištima Baške, Jurandvora i Batomlja na kojima ima deset mrgara od kojih su tri napuštena, a sedam se još koristi. Na susjednom, nenaseljenom otoku Prviću ima ih još pet. Površina mrgara ima središnji dio (*salu*) u koju se utjera stado i obodne odjeljke (*mrgariće*) u koje se razvrstavaju ovce. Građeni su od jednostruke gromače (*unjulice*) pa traže redovno održavanje koje obavljaju domaći pastiri, sukladno svojim trenutnim potrebama, zbog čega mrgari mijenjaju oblik. Jedinstveni su na području Županije i rijetki jer su zabilježeni još samo u Walesu u Velikoj Britaniji te na Islandu. Model za njihovu zaštitu i očuvanje ne može biti konzervacija jer bi ona značila njihovo napuštanje ili, kako je to lijepo rekao Berislav Horvatić, autor teksta o mrgarima, „… ti golemi cvjetovi venu i propadaju ako se za njih ne brinu. Mogu preživjeti samo ako ostanu u aktivnoj uporabi, što ujedno znači prihvaćanje njihova stalnog mijenjanja." (Horvatić, 2016)



Slika 7: Lokva Diviška na vapnenačkoj visoravni iznad Baške na otoku Krku, autor: Randić, M., 2015.

ju ispašu stada stočara iz više različitih mjesta (Slika 7). Zaštita lokvi otoka Krka tema je međunarodnog projekta LOKNA financiranog sredstvima Europskog fonda za regionalni razvoj.[13]

REZULTATI ISTRAŽIVANJA I RASPRAVA

U skladu s postavkama metode Urbanizam naslijeđa (*Heritage Urbanism*), najprije su za svaki odabrani tip krajolika istražene i utvrđene identitetske vrijednosti – čimbenici identiteta. Zatim su na temelju prepoznatih čimbenika identiteta utvrđeni kriteriji za vrjednovanje toga krajolika te za nove zahvate u njemu. Polazište za utvrđivanje novoga, budućeg modela korištenja pojedinog tipa krajolika je dosadašnji model korištenja toga prostora. Temeljem povijesnog ili sadašnjeg modela te na temelju čimbenika identiteta i kriterija postavljaju se osnove novog modela korištenja i prilagodbe suvremenim potrebama.

Identitetske vrijednosti odabranih tipova krajolika – čimbenici identiteta

Identitetske vrijednosti odabranih tipova krajolika utvrđene su na temelju prirodnih čimbenika, njihova povijesnog i društvenog značenja te prepoznatljivih vrijednosti graditeljskog sklopa i/ili krajobraznog oblikovanja.

Za **povijesni urbani krajolik akropolskih gradića Kvarnera (u priobalju i na otocima)** prepoznati su sljedeći prirodni čimbenici: smještaj u zaleđu obalne crte priobalja i otoka ili na strmim liticama nad morem, položaj na istaknutim uzvišenjima, vizualna eksponiranost te padine i okolni prostor obrasli autohtonom vegetacijom.

Njihovo povijesno značenje očituje se u činjenici da se radi o povijesnome urbanom krajoliku srednjevjekovnih malih gradova nastalih na kontinuitetu gradinskih naselja, zatim u postojanju kaštela kao pojedinačnih kulturnih dobara znakovitih za povijesno razdoblje srednjega vijeka te u povezanosti više kaštela s povijesnom plemićkom obitelji Frankopan. Društveno značenje ovoga tipa krajobraza je u potencijalu za njihovo društveno i ekonomsko korištenje.

Kao vrijednost graditeljskog sklopa prepoznata je karakteristična slika naselja oblikovana znakovitim uzorcima naselja i arhitektonskim elementima kao što su kašteli, crkve, zvonici, uske uličice, krovovi, sve uz specifično arhitektonsko oblikovanje. Posebna je vrijednost krajobraznog oblikovanja korištenje zemljišta prilagođeno prirodnoj krajobraznoj strukturi. Odnos naselja s okolinom očituje se u vizurama na naselja smještena na uzvišenjima iz okolnog prostora te vizurama iz naselja prema okolnom prostoru, što im daje veliku doživljajnu vrijednost. Zbog navedenoga su krajolici akropolskih gradića iznimno prepoznatljivi za područje Kvarnera, ali i posebno vizualno osjetljivi na nove zahvate.

U slučaju **vinogradarskih krajolika polja Pavlomir u Vinodolskoj dolini i Vrbničkog polja na otoku Krku** prirodni čimbenici koji određuju značajke krajolika su: smještaj u zaleđu obalne crte priobalja i otoka, relativno prostrane površine polja, vizualna eksponiranost i okruženost padinama obraslim autohtonom vegetacijom.

U oba slučaja radi se o poljoprivrednim površinama koje se više desetljeća koriste za istu svrhu pa ih možemo smatrati povijesnim agrarnim krajolicima u kojima je uzgoj vinove loze omogućen antropogenim utjecajem. Ranije su u Vrbničkom polju sađene jednogodišnje poljoprivredne kulture (pšenica, kukuruz, povrće), a uzgoj vinove loze kao višegodišnje kulture omogućen je nakon 1950-ih godina provedene melioracije. Nasuprot tome, polje Pavlomir potrebno je navodnjavati.

Društveno značenje sastoji se u tome da oba polja imaju potencijal za gospodarsko korištenje – s jedne strane za egzistenciju stanovništva, a s druge za razvoj ugostiteljstva i turizma.

Prepoznatljive vrijednosti krajobraznog oblikovanja su: korištenje zemljišta prilagođeno prirodnoj krajobraznoj strukturi, karakteristična slika polja te odnos polja s okolinom (vizure na polja iz okolnog prostora i vizure iz polja prema okolnom prostoru), što sve pridonosi prepoznatljivosti krajolika i njegovoj doživljajnoj vrijednosti.

Prirodni čimbenici koji određuju identitet **suhozidnog krajolika otoka – pašnjačkog krajolika vapnenačke**

13 U okviru Operativnog programa Slovenija - Hrvatska 2007-2013 potpisan je Sporazum o partnerstvu između projektnih partnera iz Slovenije (Geodetski inštitut Slovenije i Javni zavod Krajinski park Ljubljansko barje) i Hrvatske (Javna ustanova „Priroda" te Grad Krk) za zajedničko provođenje projekta LOKNA. Opći cilj projekta je očuvanje i revitalizacija vodenih biotopa (lokve na otoku Krku i barjanska okna u Ljubljanskom barju) kroz zajednički, prekogranični pristup vrednovanja, inventarizacije, revitalizacije i promocije vodenih biotopa u sadašnjim zaštićenim ili Natura 2000 područjima na pograničnom području (Projekt LOKNA).

zaravni iznad Baške na otoku Krku su: smještaj u zaleđu obalne crte otoka, velika pašnjačka prostranstva, kamenjar krša, rijetka niska vegetacija trava, rijetki prirodni izvori vode i lokve te vizualna eksponiranost.

Povijesno značenje odražava se u činjenici da se radi o povijesnim pašnjačkim površinama s prepoznatljivim povijesnim antropogenim elementima – suhozidima-gromačama, mrgarima i lokvama koje svjedoče ne samo o graditeljskoj tradiciji nego i o održivom stočarstvu i suživotu čovjeka i prirode u specifičnim uvjetima krša.

Takav krajolik ima potencijal za ekonomsko korištenje – s jedne strane za egzistenciju stanovništva, a s druge za razvoj turizma i ugostiteljstva.

Prepoznatljive vrijednosti krajobraznog oblikovanja su: korištenje zemljišta prilagođeno prirodnoj krajobraznoj strukturi, karakteristična slika i prepoznatljivost pašnjačkog krajolika, graditeljski elementi - gromače, mrgari i lokve te vizure prema okolnom prostoru, što sve daje krajoliku posebnu doživljajnu vrijednost.

Iz navedenih podataka razvidno je da su prirodni čimbenici različiti za svaki tip krajolika, s time da je svima zajednička vizualna eksponiranost. Njihovo je povijesno i društveno značenje uvjetovano povijesnim kontinuitetom korištenja za istu svrhu, ovisnošću o prisutnosti i djelovanju čovjeka te im je zajednički potencijal za društveno i ekonomsko korištenje. U pogledu prepoznatljivih vrijednosti graditeljskog sklopa i/ili krajobraznog oblikovanja svim je odabranim tipovima krajolika zajedničko korištenje zemljišta prilagođeno prirodnoj krajobraznoj strukturi, karakteristična slika krajobraza te prepoznatljivost i doživljajna vrijednost krajobraza.

Kriteriji za vrjednovanje i za nove zahvate u odabranim primjerima krajolika

U ovome radu znakoviti krajolici Primorsko-goranske županije sagledavani su kao prostorna vrijednost te kao čimbenik lokalnog i regionalnog identiteta, u jedinstvu sa zaštićenim nepokretnim kulturnim dobrima i zaštićenim prirodnim vrijednostima te biološkom raznolikošću. Za vrjednovanje odabranih primjera krajolika primijenjeni su kriteriji sistematizirani u knjizi „Krajolik kao kulturno naslijeđe" (Dumbović Bilušić, 2015, 224-237) te oni navedeni u dokumentu „Krajobrazi Primorsko-goranske županije – krajobrazna osnova, analize i razvojni okviri" te su, zajedno s kriterijima za nove zahvate u njima sistematizirani u tabeli 2.

Analiza podataka sistematiziranih u tabeli 2 pokazuje da su, uz kriterije koji su specifični za svaki tip krajolika, zajednički kriteriji za vrjednovanje svih odabranih primjera krajolika cjelovitost, estetske značajke, dobro stanje prirodnih i kulturnih sastavnica te potencijal za egzistenciju stanovništva te za razvoj više oblika turizma (kulturni turizam, agro-turizam i eko-turizam). Kriteriji za nove zahvate razlikuju se u ovisnosti o posebnim značajkama pojedinih tipova krajolika, a zajednički je kriterij očuvanje osnovnih prostornih i ambijentalnih odnosa.

Modeli korištenja odabranih primjera krajolika

Kriteriji za nove zahvate u odabranim primjerima krajolika proizašli su iz analize čimbenika identiteta i kriterija njihova vrjednovanja. Na temelju podataka o povijesnom i sadašnjem korištenju prostora te recentnim naporima područne (regionalne) i lokalne samouprave da s jedne strane očuva i zaštiti ove vrijedne prostore naslijeđa, a s druge strane da ih revitalizira, prepoznat je dosadašnji model korištenja odabranih primjera krajolika. Temeljem kriterija za nove zahvate u odabranim primjerima krajolika te uvažavajući pozitivna iskustva dosadašnjih modela, utvrđene su osnove novoga, budućeg modela.

Za postojeći model korištenja **povijesnih urbanih krajolika akropolskih gradića Kvarnera** znakovito je da se njihova obnova provodila temeljem vrijednosti utvrđenih u suradnji prostornih planera i konzervatora, a revitalizacija novom javnom namjenom građevina za izložbene prostore, muzeje, vijećnice i slične reprezentativne prostore javne uprave, knjižnice i čitaonice, prostore za vjenčanja i višenamjenske dvorane. Provedeno je i objedinjavanje povezanih priča u tematske putove – primjer projekta Putovima Frankopana. Za suvremeni model predlaže se uređenje prostora i ostvarenje sadržaja na način koji će afirmirati duh mjesta, vremensko razdoblje nastanka urbanog krajolika (srednji vijek), uključujući način života, tradicije i vještine, obrte i sl., uz očuvanje osnovnih prostornih i ambijentalnih odnosa. Nova namjena graditeljskih sklopova treba biti javna. Prilikom revitalizacije potrebno je ostvariti povezanost sa sličnim modelima krajobraza i nasloniti se na ranije projekte (tematski putovi). Poželjno je uređenje interpretacijskih centara za posjetitelje te razvoj kulturnog turizma, uz organizaciju priredbi i festivala.

Postojeći model korištenja **vinogradarskih krajolika polja Pavlomir u Vinodolskoj dolini i Vrbničkog polja na otoku Krku** temelji se na oživljavanju i širenju proizvodnje uz primjenu suvremenih načina obrade tla te na razvoju ugostiteljstva i agro-turizma. Suvremeni model bi trebao zadržati proizvodnju u postojećim granicama polja, uz mogućnost širenja na okolne padine. Prostor bi trebalo koristiti za razvoj agro-turizma i ugostiteljstva baziranog na lokalnim proizvodima i gastronomiji. Naglasak može biti na povezanosti više sličnih lokaliteta pri čemu poveznica može biti uzgoj istih sorti i proizvodnja istih vina, što je baza za ostvarenje tematskih vinskih putova.

Postojeći model korištenja **suhozidnog krajolika otoka – pašnjačkog krajolika vapnenačke zaravni iznad Baške na otoku Krku** bazira se na tradicionalnom ekstenzivnom ovčarstvu i održavanju gromača, mrgara i lokvi te na razvoju ugostiteljstva i turizma u Baški i okolnim mjestima. Suvremeni model treba očuvati tradicionalno ekstenzivno ovčarstvo, što je uvjet održavanja gromača, mrgara i lokvi. Razvoj agro-turizma i eko-turizma te ugostiteljstva u Baški i okolnim mjestima treba se između ostalih resursa bazirati i na lokalnim proi-

Tabela 2: Kriteriji za vrjednovanje i za nove zahvate u odabranim primjerima krajolika (izvor: Autori, 2016).

KRITERIJI ZA VRJEDNOVANJE I ZA NOVE ZAHVATE U ODABRANIM PRIMJERIMA KRAJOLIKA	
Povijesni urbani krajolik akropolskih gradića Kvarnera (u priobalju i na otocima)	
a) kriteriji za vrjednovanje	Cjelovitost - visok je stupanj očuvanosti karakteristične slike naselja koja odražava njegovu izvornu lokaciju i prostornu organizaciju te visoki stupanj očuvanosti oblikovanja arhitektonskih elemenata Izvornost - zamjetan je stupanj očuvanosti izvornih elemenata organizacije, oblikovanja, struktura i građe krajolika, funkcija i sadržaja te tradicije Reprezentativnost - krajolik sadrži sve elemente i krajobrazne uzorke koji karakteriziraju povijesni urbani krajolik srednjevjekovnih malih gradova nastalih na kontinuitetu gradinskih naselja Usklađenost - visok je stupanj skladnosti prirodnih datosti i izgrađenih elemenata Estetske značajke - radi se o visoko prepoznatljivim panoramskim slikama, harmoničnim kompozicijama s naglašenim vertikalnim akcentima, vrlo je visoka vizualna izloženost prostora, velik je broj razglednih točaka, a u Vinodolskoj dolini i panoramskih koridora Stanje - prirodne i kulturne sastavnice u dobrom su stanju za svoju klasu Potencijal - za javnu društvenu namjenu i za kulturni turizam
b) kriteriji za nove zahvate u prostoru naslijeđa	Očuvanje osnovnih prostornih i ambijentalnih odnosa Afirmacija duha mjesta, vremenskog razdoblja nastanka urbanog krajolika (srednji vijek), uključujući način života, tradicije i vještine, obrte i sl. Nova namjena graditeljskih sklopova treba biti javna Naglasiti povezanosti više sličnih lokaliteta istom povijesnom obitelji – primjerice kašteli nekadašnje obitelji Frankopan
Vinogradarski krajolik polja Pavlomir u Vinodolskoj dolini i Vrbničkog polja na otoku Krku	
a) kriteriji za vrjednovanje	Cjelovitost - visok je stupanj očuvanosti karakteristične slike polja koja odražava njegovu izvornu lokaciju i prostornu organizaciju Rijetkost - polja ovakve veličine relativno su rijetka u priobalju i na otocima gdje je poljoprivrednih površina malo te su uglavnom male površine Usklađenost - visok je stupanj skladnosti polja i okolnog prostora Estetske značajke - radi se o prepoznatljivim panoramskim slikama, visoka je vizualna izloženost prostora Prirodne i kulturne sastavnice u dobrom su stanju za svoju klasu Potencijal za egzistenciju stanovništva i razvoj ugostiteljstva i turizma
b) kriteriji za nove zahvate u prostoru naslijeđa	Očuvanje osnovnih prostornih i ambijentalnih odnosa Afirmacija vinogradarske proizvodnje te proizvodnje kvalitetnih vina
Suhozidni krajolik otoka – pašnjački krajolik vapnenačke zaravni iznad Baške na otoku Krku	
a) kriteriji za vrjednovanje	Cjelovitost - visok je stupanj očuvanosti karakteristične slike pašnjaka koja odražava njihovu izvornu lokaciju i prostornu organizaciju Rijetkost – pašnjačke površine sadrže rijetke elemente – mrgare, a kilometrima duge gromače razdvajaju pasišta i lokve Estetske značajke - radi se o prepoznatljivim panoramskim slikama, visoka je vizualna izloženost prostora Prirodne i kulturne sastavnice su u izvrsnom stanju za svoju klasu Velika osjetljivost i ranjivost krajolika Ovisnost o antropogenom utjecaju – za očuvanje krajolika nužna je prisutnost čovjeka radi održavanja gromača i mrgara te za ispašu ovaca, čime se i održavaju prirodni travnjaci Potencijal za egzistenciju stanovništva i razvoj ugostiteljstva i turizma
b) kriteriji za nove zahvate u prostoru naslijeđa	Očuvanje karakterističnih elemenata krajolika: gromača, mrgara i lokvi Očuvanje osnovnih prostornih i ambijentalnih odnosa Afirmacija tradicionalnog ekstenzivnog ovčarstva Nove zahvate radi razvoja ugostiteljstva i turizma planirati izvan ovoga kamenjarskog prostora

zvodima i gastronomiji te promidžbi iznimnih ljepota ovoga specifičnoga krškog krajolika.

Zaključno se može utvrditi da je analiza postojećih, dosadašnjih modela korištenja odabranih primjera krajolika pokazala da je županijska i lokalna samouprava, u suradnji s lokalnim stanovništvom i poduzetnicima, nastojala revitalizirati ove vrijedne dijelove naslijeđa provedbom više projekata kojima su osnova bili dokumenti prostornog uređenja, dokumenti zaštite okoliša i prirode, kao i pojedinačna rješenja o njihovoj zaštiti, u kojima je njihova vrijednost prepoznata i u kojima su artikulirani uvjeti za nove zahvate u prostorima toga naslijeđa. Novi, suvremeni model treba uvažiti dosadašnja pozitivna iskustva te planirati i provesti nove projekte na principu aktivne zaštite kojom će se očuvati prepoznati čimbenici identiteta i kojima će ovi krajolici ostati temelj egzistencije lokalnog stanovništva i temelj razvoja selektivnih oblika turizma (kulturni turizam, agro-turizam, eko-turizam).

ZAKLJUČAK

Primorsko-goranska županija obiluje krajobraznom i biološkom raznolikošću te se ona, zajedno s bogatim kulturno-povijesnim naslijeđem, koristi kao značajan resurs društvenog i gospodarskog, posebice turističkog razvoja, čiji je glavni slogan *Raznolikost je lijepa*. Potencijal korištenja ovih vrijednosti kao pokretača gospodarskoga i društvenog razvoja prepoznala je Primorsko-goranska županija kao jedinica područne (regionalne) samouprave, kao i pojedini gradovi i općine, te su tijekom niza godina provedeni ili se još provode brojni projekti u tom cilju. Nastavno na dosadašnja pozitivna iskustva, u radu se na odabranim primjerima krajolika znakovitih za identitet Županije, istražuje mogućnost primjene metode i modela Urbanizam naslijeđa (*Heritage Urbanism*) za nove, buduće zahvate u prostoru naslijeđa. S obzirom da se ova metoda bazira na utvrđivanju identitetskih vrijednosti naslijeđa te na kriterijima za vrjednovanje i za nove zahvate u njima te na principu aktivne zaštite, istraživanje je potvrdilo ispravnost takvoga pristupa neovisno o kojem tipu naslijeđa se radi. Zbog već sada primijenjenih i potencijalnih budućih modela korištenja krajolika u tome smislu, autori drže iskustvo Primorsko-goranske županije vrijednim primjerom u sklopu projekta Urbanizam naslijeđa (*Heritage Urbanism*) i šire.

LANDSCAPE AS A NATURAL AND CULTURAL HERITAGE AND ENGINE OF ECONOMIC AND SOCIAL DEVELOPMENT OF THE KVARNER COUNTY

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SUMMARY

The subject of this paper is landscape as natural and cultural heritage and a significant factor in the identity of the County of Primorje-Gorski Kotar. The paper presents how individual landscape areas in the county are identified and evaluated in physical planning, environmental and nature protection documents, and landscape studies. On the basis of selected landscapes, the paper explores the application of a method that seeks to affirm a scientifically based approach to new interventions in cultural heritage areas so that this heritage can become a driver of the economic and social development under the condition of preserving its identity values.

Keywords: landscape, The County of Primorje and Gorski Kotar, criteria, methods and models of revitalisation of the cultural and natural heritage

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KAZALO K SLIKAM NA OVITKU

NASLOVNICA: *San Francesco nel deserto* (Sveti Frančišek v puščavi) Giovannija Bellinija (1433–1516) (*The Frick Collection*, New York). Suhozidne terase prekrivajo pobočje gore v ozadju, na levi.
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Figure 8: *View of Haarlem* (the Netherlands) *with Bleaching Grounds*, around 1670 (Annenberg Learner, 2015). The Museum of Modern Art in Zürich, Jacob van Ruisdael (1628–1682), oil on canvas, 62.5 x 55.2 cm, Prof. Dr. L. Ružička Foundation, 1949.
Figure 9: Part of Zaanse Schans neighbourhood, the Netherlands (Cris Toala Olivares).
Figure 10: Ritual for mountain deity in Apu Qarwarasu (Courtesy of Mr. Adripino Jayo, Ayacucho, Peru).

NAVODILA AVTORJEM

1. Revija ANNALES *(Anali za istrske in mediteranske študije* Ser. hist et soc.) objavlja **izvirne** in **pregledne znanstvene članke** z družboslovnimi in humanističnimi vsebinami, ki se navezujejo na preučevanje *zgodovine, kulture in družbe* Istre in Mediterana. Vključujejo pa tudi *primerjalne in medkulturne študije* ter *metodološke in teoretične* razprave, ki se nanašajo na omenjeno področje.

2. Sprejemamo članke v slovenskem, italijanskem, hrvaškem in angleškem jeziku. Avtorji morajo zagotoviti jezikovno neoporečnost besedil, uredništvo pa ima pravico članke dodatno jezikovno lektorirati.

3. Članki naj obsegajo do 48.000 znakov brez presledkov oz. 2 avtorski poli besedila. Članek je mogoče oddati na e-naslov Annaleszdjp@gmail.com ali na elektronskem nosilcu (CD) po pošti na naslov uredništva.

Avtor ob oddaji članka zagotavlja, da članek še ni bil objavljen in se obvezuje, da ga ne bo objavil drugje.

4. Naslovna stran članka naj vsebuje naslov in podnaslov članka, ime in priimek avtorja, avtorjeve nazive in akademske naslove, ime in naslov inštitucije, kjer je zaposlen, oz. domači naslov vključno s poštno številko in naslovom elektronske pošte. Razen začetnic in kratic pisati z malimi črkami.

5. Članek mora vsebovati **povzetek** in **izvleček.** Izvleček je krajši (max. 100 besed) od povzetka (cca. 200 besed).

V *izvlečku* na kratko opišemo namen, metode dela in rezultate. Izvleček naj ne vsebuje komentarjev in priporočil.

Povzetek vsebuje opis namena in metod dela ter povzame analizo oziroma interpretacijo rezultatov. V povzetku ne sme biti ničesar, česar glavno besedilo ne vsebuje.

6. Avtorji naj pod izvleček članka pripišejo ustrezne **ključne besede**. Potrebni so tudi **angleški (ali slovenski) in italijanski prevodi** izvlečka, povzetka, ključnih besed, podnapisov k slikovnemu in tabelarnemu gradivu.

7. Zaželeno je tudi (originalno) **slikovno gradivo**, ki ga avtor posreduje v ločenih datotekah (jpeg, tiff) z najmanj 300 dpi resolucije pri želeni velikosti. Največja velikost slikovnega gradiva je 17x20 cm. Vsa potrebna dovoljenja za objavo slikovnega gradiva (v skladu z Zakonom o avtorski in sorodnih pravicah) priskrbi avtor sam in jih predloži uredništvu pred objavo članka. Vse slike, tabele in grafične prikaze je potrebno tudi podnasloviti in zaporedno oštevilčiti.

8. Vsebinske *opombe*, ki besedilo še podrobneje razlagajo ali pojasnjujejo, postavimo *pod črto*.

Bibliografske opombe, s čimer mislimo na citat – torej sklicevanje na točno določeni del besedila iz neke druge publikacije, sestavljajo naslednji podatki: *avtor, leto izida* in – če citiramo točno določeni del besedila – tudi navedba *strani*. Bibliografske opombe vključimo v glavno besedilo.

Celotni bibliografski podatki citiranih in uporabljenih virov so navedeni v poglavju *Viri in literatura* (najprej navedemo vse vire, nato literaturo). Pri tem avtor navede izključno dela ter izdaje, ki jih je v članku citiral.

Primer citata med besedilom:

(Kalc, 2010, 426).

Primer navajanja vira kot celote:

(Kalc, 2010).

Popolni podatki o tem viru v poglavju Literatura pa se glasijo:

Kalc, A. (2010): „Statistični podatki o Trstu" ob tretji francoski zasedbi leta 1809. Annales, Ser. hist. sociol., 20, 2, 423–444.

Če citiramo *več del istega avtorja iz istega leta*, poleg priimka in kratice imena napišemo še črke po abecednem vrstnem redu, tako da se viri med seboj razlikujejo. Primer:

(Kalc, 2010a) in (Kalc, 2010b).

Bibliografska opomba je lahko tudi del vsebinske opombe in jo zapisujemo na enak način.

Posamezna dela ali navedbe virov v isti opombi ločimo s podpičjem. Primer:

(Kalc, 2010a, 15; Verginella, 2008, 37).

9. Pri **citiranju arhivskih virov** *med oklepaji* navajamo kratico arhiva, kratico arhivskega fonda / signaturo, številko tehnične enote in številko arhivske enote. Primer:

(ARS-1851, 67, 1808).

V primeru, da arhivska enota ni znana, se dokument citira po naslovu *v opombi pod črto*, in sicer z navedbo kratice arhiva, kratice arhivskega fonda / signature, številke tehnične enote in naslova dokumenta. Primer:

ARS-1589, 1562, Zapisnik seje Okrajnega komiteja ZKS Koper, 19. 12. 1955.

Kratice razložimo v poglavju o virih na koncu članka, kjer arhivske vire navajamo po abecednem vrstnem redu.

Primer:

ARS-1589 – Arhiv republike Slovenije (ARS), Centralni komite Zveze komunistov Slovenije (fond 1589).

10. Pri citiranju časopisnih virov med tekstom navedemo ime časopisa, datum izdaje ter strani:

(Primorske novice, 11. 5. 2009, 26).

V primeru, da je znan tudi naslov članka, celotno bibliografsko opombo navedemo *pod črto*:

Primorske novice, 11. 5. 2009: Ali podjetja merijo učinkovitost?, 26.

V seznam virov in literature izpišemo ime časopisa / revije, kraj, založnika in periodo izhajanja.

Primer:

Primorske novice. Koper, Primorske novice, 1963–.

11. Poglavje o virih in literaturi je obvezno. Bibliografske podatke navajamo takole:

- Opis zaključene publikacije kot celote – knjige:

Avtor (leto izida): Naslov. Kraj, Založba. Npr.:

Šelih, A., Antić Gaber, M., Puhar, A., Rener, T., Šuklje, R., Verginella, M. & L. Tavčar (2007): Pozabljena polovica. Portreti žensk 19. in 20. stoletja na Slovenskem. Ljubljana, Tuma, SAZU.

V zgornjem primeru, kjer je *avtorjev več kot dva*, je korekten tudi citat:

(Šelih et al., 2007).

Če navajamo določeni del iz zaključene publikacije, zgornjemu opisu dodamo še številke strani, od koder smo navedbo prevzeli.

- Opis prispevka v **zaključeni publikaciji** – npr. prispevka v zborniku:

Avtor (leto izida): Naslov prispevka. V: Avtor knjige: Naslov knjige. Kraj, Založba, strani od-do. Primer:

Lenarčič, B. (2010): Omrežna družba, medkulturnost in prekokulturnost. V: Sedmak, M. & E. Ženko (ur.): Razprave o medkulturnosti. Koper, Založba Annales, 245–260.

- Opis članka v **reviji:**

Avtor, (leto izida): Naslov članka. Naslov revije, letnik, številka strani od-do. Primer:

Lazar, I. (2008): Celejski forum in njegov okras. Annales, Ser. hist. sociol., 19, 2, 349–360.

- Opis **ustnega vira**:

Informator (leto izporočila): Ime in priimek informatorja, leto rojstva, vloga, funkcija ali položaj. Način pričevanja. Oblika in kraj nahajanja zapisa. Primer:

Žigante, A. (2008): Alojz Žigante, r. 1930, župnik v Vižinadi. Ustno izporočilo. Zvočni zapis pri avtorju.

- Opis **vira iz internetnih spletnih strani**:

Če je mogoče, internetni vir zabeležimo enako kot članek in dodamo spletni naslov ter v oklepaju datum zadnjega pristopa na to stran:

Young, M. A. (2008): The victims movement: a confluence of forces. In: NOVA (National Organization for Victim Assistance). Http://www.trynova.org/victiminfo/readings/VictimsMovement.pdf (15. 9. 2008).

Če avtor ni znan, navedemo nosilca spletne strani, leto objave, naslov in podnaslov besedila, spletni naslov in v oklepaju datum zadnjega pristopa na to stran.

Članki so razvrščeni po abecednem redu priimkov avtorjev ter po letu izdaje, v primeru da gre za več citatov istega-istih avtorjev.

12. Kratice v besedilu moramo razrešiti v oklepaju, ko se prvič pojavijo. Članku lahko dodamo tudi seznam uporabljenih kratic.

13. Pri **ocenah publikacij** navedemo v naslovu prispevka avtorja publikacije, naslov, kraj, založbo, leto izida in število strani (oziroma ustrezen opis iz točke 10).

14. Prvi odtis člankov uredništvo pošlje avtorjem v **korekturo.** Avtorji so dolžni popravljeno gradivo vrniti v enem tednu.

Širjenje obsega besedila ob korekturah ni dovoljeno. Druge korekture opravi uredništvo.

15. Za dodatna pojasnila v zvezi z objavo člankov je uredništvo na voljo.

UREDNIŠTVO

ISTRUZIONI PER GLI AUTORI

1. La rivista ANNALES (Annali per gli studi istriani e mediterranei, Ser. hist. et soc.) pubblica **articoli scientifici originali e rassegne** dai contenuti sociologici e umanistici relativi allo studio della *storia, cultura e società* dell'Istria e del Mediterraneo. Include inoltre *studi comparativi e interculturali* nonché saggi *metodologici e teorici* pertinenti a questa area geografica.

2. La Redazione accetta articoli in lingua slovena, italiana, croata e inglese. Gli autori devono garantire l'ineccepibilità linguistica dei testi, la Redazione si riserva il diritto di una revisione linguistica.

3. Gli articoli devono essere di lunghezza non superiore alle 48.000 battute senza spazi, ovvero 2 fogli d'autore. Possono venir recapitati all'indirizzo di posta elettronica Annaleszdjp@gmail.com oppure su supporto elettronico (CD) per posta ordinaria all'indirizzo della Redazione.

L'autore garantirà l'originalità dell'articolo e si impegnerà a non pubblicarlo altrove.

4. Ogni articolo deve essere corredato da: titolo, eventuale sottotitolo, nome e cognome dell'autore, denominazione ed indirizzo dell'ente di appartenenza o, in alternativa, l'indirizzo di casa, nonché l'eventuale indirizzo di posta elettronica. Tranne sigle e acronimi scrivere in minuscolo.

5. I contributi devono essere corredati da un **riassunto** e da una **sintesi**. Quest'ultima sarà più breve (max. 100 parole) del riassunto (cca 200 parole).

Nella *sintesi* si descriveranno brevemente i metodi e i risultati delle ricerche e anche i motivi che le hanno determinate. La sintesi non conterrà commenti e segnalazioni.

Il *riassunto* riporterà in maniera sintetica i metodi delle ricerche, i motivi che le hanno determinate assieme all'analisi, cioè all'interpretazione, dei risultati raggiunti. Si eviterà di riportare conclusioni omesse nel testo del contributo.

6. Gli autori sono tenuti ad indicare le **parole chiave** adeguate. Sono necessarie anche le **traduzioni in inglese (o sloveno) e italiano** della sintesi, del riassunto, delle parole chiave, delle didascalie, delle fotografie e delle tabelle.

7. L'eventuale **materiale iconografico** (originale) va preparato in formato elettronico (jpeg, tiff) e consegnato in file separati alla definizione di 300 dpi a grandezza desiderata, purché non ecceda i 17x20 cm. Prima della pubblicazione, l'autore provvederà a fornire alla Redazione tutte le autorizzazioni richieste per la riproduzione del materiale iconografico (in virtù della Legge sui diritti d'autore). Tutte le immagini, tabelle e grafici dovranno essere accompagnati da didascalie e numerati in successione.

8. Le **note a piè di pagina** sono destinate essenzialmente a fini esplicativi e di contenuto.

I **riferimenti bibliografici** richiamano un'altra pubblicazione (articolo). La nota bibliografica, riportata nel testo, deve contenere i seguenti dati: *cognome dell'autore*, *anno di pubblicazione* e, se citiamo un determinato brano del testo, anche le *pagine*.

I riferimenti bibliografici completi delle fonti vanno quindi inseriti nel capitolo Fonti e bibliografia (saranno prima indicate le fonti e poi la bibliografia). L'autore indicherà esclusivamente i lavori e le edizioni citati nell'articolo.

Esempio di citazione nel testo:

(Borean, 2010, 325).

Esempio di riferimento alla fonte, senza citazione:

(Borean, 2010).

I dati completi su questa fonte nel capitolo Fonti e bibliografia verranno riportati in questa maniera:

Borean, L. (2010): Collezionisti e opere d'arte tra Venezia, Istria e Dalmazia nel Settecento. Annales, Ser. hist. sociol. 20, 2, 323–330.

Se si citano *più lavori dello stesso autore* pubblicati nello stesso anno accanto al cognome va aggiunta una lettera in ordine alfabetico progressivo per distinguere i vari lavori. Ad es.:

(Borean, 2010a) e (Borean, 2010b).

Il riferimento bibliografico può essere parte della nota a pié di pagina e va riportato nello stesso modo come sopra.

Singole opere o vari riferimenti bibliografici in una stessa nota vanno divisi dal punto e virgola. Per es.:

(Borean, 2010a, 37; Verginella, 2008, 37).

9. Le **fonti d'archivio** vengono citate nel testo, *tra parentesi*. Si indicherà: sigla dell'archivio – numero (oppure) sigla del fondo, numero della busta, numero del documento (non il suo titolo). Ad es.:

(ASMI-SLV, 273, 7r).

Nel caso in cui un documento non fosse contraddistinto da un numero, ma solo da un titolo, la fonte d'archivio verrà citata *a piè di pagina*. In questo caso si indicherà: sigla dell'archivio – numero (oppure) sigla del fondo, numero della busta, titolo del documento. Ad es.:

ACS-CPC, 3285, Milanovich Natale. Richiesta della Prefettura di Trieste spedita al Ministero degli Interni del 15 giugno 1940.

Le sigle utilizzate verranno svolte per intero, in ordine alfabetico, nella sezione »Fonti« a fine testo. Ad es.:

ASMI-SLV – Archivio di Stato di Milano (ASMI), f. Senato Lombardo-Veneto (SLV).

10. Nel citare fonti di giornale nel testo andranno indicati il nome del giornale, la data di edizione e le pagine:

(Il Corriere della Sera, 18. 5. 2009, 26)

Nel caso in cui è noto anche il titolo dell'articolo, l'intera indicazione bibliografica verrà indicata *a piè di pagina*:

Il Corriere della Sera, 18. 5. 2009: Da Mestre all'Archivio segreto del Vaticano, 26.

Nell'elenco Fonti e bibliografia scriviamo il nome del giornale, il luogo di edizione, l'editore ed il periodo di pubblicazione.

Ad es.:

Il Corriere della Sera. Milano, RCS Editoriale Quotidiani, 1876–.

11. Il capitolo **Fonti e bibliografia** è obbligatorio. I dati bibliografici vanno riportati come segue:

- Descrizione di un'opera compiuta:

autore/i (anno di edizione): Titolo. Luogo di edizione, casa editrice. Per es.:

Darovec, D., Kamin Kajfež, V. & M. Vovk (2010): Tra i monumenti di Isola : guida storico-artistica del patrimonio artistico di Isola. Koper, Edizioni Annales.

Se *gli autori sono più di due*, la citazione è corretta anche nel modo seguente:

(**Darovec et al., 2010**)

Se indichiamo una parte della pubblicazione, alla citazione vanno aggiunte le pagine di riferimento.

Descrizione di un articolo che compare in un **volume miscellaneo:**

- autore/i del contributo (anno di edizione): Titolo. In: autore/curatore del libro: titolo del libro, casa editrice, pagine (da-a). Per es.:

Povolo, C. (2014): La giusta vendetta. Il furore di un giovane gentiluomo. In: Povolo, C. & A. Fornasin (eds.): Per Furio. Studi in onore di Furio Bianco. Forum, Udine, 179-195.

Descrizione di un articolo in una **pubblicazione periodica – rivista:**

autore/i (anno di edizione): Titolo del contributo. Titolo del periodico, annata, nro. del periodico, pagine (da-a). Per es.:

Cergna, S. (2013): Fluidità di discorso e fluidità di potere: casi d'internamento nell'ospedale psichiatrico di Pola d'Istria tra il 1938 e il 1950. Annales, Ser. hist. sociol., 23, 2, 475-486.

Descrizione di una **fonte orale**:

informatore (anno della testimonianza): nome e cognome dell'informatore, anno di nascita, ruolo, posizione o stato sociale. Tipo di testimonianza. Forma e luogo di trascrizione della fonte. Per es.:

Žigante, A. (2008): Alojz Žigante, r. 1930, parroco a Visinada. Testimonianza orale. Appunti dattiloscritti dell'intervista presso l'archivio personale dell'autore.

Descrizione di una **fonte tratta da pagina internet**:

Se è possibile registriamo la fonte internet come un articolo e aggiungiamo l'indirizzo della pagina web e tra parentesi la data dell'ultimo accesso:

Young, M. A. (2008): The victims movement: a confluence of forces. In: NOVA (National Organization for Victim Assistance). (15. 9. 2008). Http://www. trynova.org/victiminfo/readings/VictimsMovement.pdf

Se l'autore non è noto, si indichi il webmaster, anno della pubblicazione, titolo ed eventuale sottotitolo del testo, indirizzo web e tra parentesi la data dell'ultimo accesso.

La bibliografia va compilata in ordine alfabetico secondo i cognomi degli autori ed anno di edizione, nel caso in cui ci siano più citazioni riferibili allo stesso autore.

12. Il significato delle **abbreviazioni** va spiegato, tra parentesi, appena queste si presentano nel testo. L'elenco delle abbreviazioni sarà riportato alla fine dell'articolo.

13. Per quanto riguarda le **recensioni**, nel titolo del contributo l'autore deve riportare i dati bibliografici come al punto 10, vale a dire autore, titolo, luogo di edizione, casa editrice, anno di edizione nonché il numero complessivo delle pagine dell'opera recensita.

14. Gli autori ricevono le **prime bozze** di stampa per la revisione. Le bozze corrette vanno quindi rispedite entro una settimana alla Redazione. In questa fase, i testi corretti non possono essere più ampliati. La revisione delle bozze è svolta dalla Redazione.

15. La Redazione rimane a disposizione per eventuali chiarimenti.

LA REDAZIONE

INSTRUCTIONS TO AUTHORS

1. The journal ANNALES *(Annals for Istrian and Mediterranean Studies,* Ser. hist et soc.) publishes **original** and **review scientific articles** dealing with social and human topics related to research on *the history, culture and society of Istria and the Mediterranean,* as well as *comparative and intercultural studies* and *methodological and theoretical discussions* related to the above-mentioned fields.

2. The articles submitted can be written in the Slovene, Italian, Croatian or English language. The authors should ensure that their contributions meet acceptable standards of language, while the editorial board has the right to have them language edited.

3. The articles should be no longer than 8,000 words. They can be submitted via e-mail (Annaleszdjp@gmail.com) or regular mail, with the electronic data carrier (CD) sent to the address of the editorial board. Submission of the article implies that it reports original unpublished work and that it will not be published elsewhere.

4. The front page should include the title and subtitle of the article, the author's name and surname, academic titles, affiliation (institutional name and address) or home address, including post code, and e-mail address. Except initials and acronyms type in lowercase.

5. The article should contain the **summary** and the **abstract,** with the former (c. 200 words) being longer than the latter (max. 100 words).

The *abstract* contains a brief description of the aim of the article, methods of work and results. It should contain no comments and recommendations.

The *summary* contains the description of the aim of the article and methods of work and a brief analysis or interpretation of results. It can contain only the information that appears in the text as well.

6. Beneath the abstract, the author should supply appropriate **keywords**, as well as the **English (or Slovene) and italian translation** of the abstract, summary, keywords, and captions to figures and tables.

7. If possible, the author should also supply (original) **illustrative matter** submitted as separate files (in jpeg or tiff format) and saved at a minimum resolution of 300 dpi per size preferred, with the maximum possible publication size being 17x20 cm. Prior to publication, the author should obtain all necessary authorizations (as stipulated by the Copyright and Related Rights Act) for the publication of the illustrative matter and submit them to the editorial board. All figures, tables and diagrams should be captioned and numbered.

8. Footnotes providing additional explanation to the text should be written at *the foot of the page*. **Bibliographic notes** – i.e. references to other articles or publications – should contain the following data: *author, year of publication* and – when citing an extract from another text – *page*. Bibliographic notes appear in the text.

The entire list of sources cited and referred to should be published in the section *Sources and Bibliography* (starting with sources and ending with bibliography). The author should list only the works and editions cited or referred to in their article.

E.g.: Citation in the text:

(Blaće, 2014, 240).

E.g.: Reference in a text:

(Blaće, 2014).

In the section on *bibliography*, citations or references should be listed as follows:

Blaće, A. (2014): Eastern Adriatic Forts in Vincenzo Maria Coronelli's Isolario Mari, Golfi, Isole, Spiaggie, Porti, Citta ... Annales, Ser hist. sociol., 24, 2, 239-252.

If you are listing *several works published by the same author in the same year*, they should be differentiated by adding a lower case letter after the year for each item.

E.g.:

(Blaće, 2014a) and (Blaće, 2014b).

If the bibliographic note appears in the footnote, it should be written in the same way.

If listed in the same footnote, individual works or sources should be separated by a semicolon. E.g.:

(Blaće, 2014, 241; Verginella, 2008, 37).

9. When **citing archival records** *within the parenthesis* in the text, the archive acronym should be listed first, followed by the record group acronym (or signature), number of the folder, and number of the document. E.g.:

(ASMI-SLV, 273, 7r).

If the number of the document can not be specified, the record should be cited *in the footnote*, listing the archive acronym and the record group acronym (or signature), number of the folder, and document title. E.g.:

TNA-HS 4, 31, Note on Interview between Colonel Fišera and Captain Wilkinson on December 16th 1939.

The abbreviations should be explained in the section on sources in the end of the article, with the archival records arranged in an alphabetical order. E.g.:

TNA-HS 4 – The National Archives, London-Kew (TNA), fond Special Operations Executive, series Eastern Europe (HS 4).

10. If referring to **newspaper sources** in the text, you should cite the name of the newspaper, date of publication and page:

If the title of the article is also known, the whole reference should be stated *in the footnote*:

The New York Times, 16. 5. 2009: Two Studies tie Disaster Risk to Urban Growth, 3.

In the list of sources and bibliography the name of the newspaper. Place, publisher, years of publication.

E.g.:

The New York Times. New York, H.J. Raymond & Co., 1857–.

11. The list of **sources and bibliography** is a mandatory part of the article**.** Bibliographical data should be cited as follows:

- Description of a non-serial publication – a book:

Author (year of publication): Title. Place, Publisher. E.g.:

Darovec, D., Kamin Kajfež, V. & M. Vovk (2010): Among the monuments of Izola : art history guide to the cultural heritage of Izola. Koper, Annales Press.

If there are *more than two authors*, you can also use et al.:

(Darovec et al., 2010)

If citing an excerpt from a non-serial publication, you should also add the number of page from which the citation is taken after the year.

- Description of an article published in a **non-serial publication** – e.g. an article from a collection of papers:

Author (year of publication): Title of article. In: Author of publication: Title of publication. Place, Publisher, pages from-to. E.g.:

Muir, E. (2013): The Anthropology of Venice. In: Dursteler, E. (ed.): A Companion to Venetian History. Leiden - Boston, Brill, 487-511.

- Description of an article from a **serial publication:**

Author (year of publication): Title of article. Title of serial publication, yearbook, number, pages from-to. E.g.:

Faričić, J. & L. Mirošević (2014): Artificial Peninsulas and Pseudo-Islands of Croatia. Annales, Ser hist. et sociol., 24, 2, 113-128.

- Description of an **oral source**:

Informant (year of transmission): Name and surname of informant, year of birth, role, function or position. Manner of transmission. Form and place of data storage. E.g.:

Žigante, A. (2008): Alojz Žigante, born 1930, priest in Vižinada. Oral history. Audio recording held by the author.

- Description of an **internet source**:

If possible, the internet source should be cited in the same manner as an article. What you should add is the website address and date of last access (with the latter placed within the parenthesis):

Young, M. A. (2008): The victims movement: a confluence of forces. In: NOVA (National Organization for Victim Assistance). Http://www.trynova.org/ victiminfo/readings/VictimsMovement.pdf (15. 9. 2008).

If the author is unknown, you should cite the organization that set up the website, year of publication, title and subtitle of text, website address and date of last access (with the latter placed within the parenthesis).

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12. The **abbreviations** should *be explained* when they first appear in the *text. You can also add a list of their explanations at the end of the article*.

13. The title of a **review article** should contain the following data: author of the publication reviewed, title of publication, address, place, publisher, year of publication and number of pages (or the appropriate description given in Item 10).

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